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Drivers of people's preferences for spatial proximity to energy infrastructure technologies: a cross-country analysis

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Abstract: Many countries plan to decarbonise their energy systems by increasing energy efficiency and expanding the use of renewable energy sources (RES). Such actions require significant investments in new energy infrastructures. While people are generally accepting of these infrastructures, opposition sometimes arises when these developments are sited at close proximity to people's residences. Therefore, it is important to understand what actually drives people's preferences for spatial proximity to different energy infrastructure technologies. This study examines the factors influencing people's proximity preferences to different energy technologies using a cross-country econometric analysis of the stated preference data from an unprecedented survey conducted on nationally representative samples of the population in Ireland, the US and Germany. The survey involved more than 4,500 participants in total. This paper presents the data and selected results from a generalised ordered logit model for each energy technology surveyed. These are; wind turbines, solar power technology, biomass power plant, coal-red power plant and natural gas power plant. The results show that, in general, German and Irish citizens are willing to accept energy infrastructures at smaller distances to their homes than their US counterparts. Moreover, attitudinal factors are found to shape people's preferences more consistently than any of the socio-demographic characteristics.

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1. Introduction

It is generally accepted that greenhouse gas emissions need to be reduced globally in order to combat the effects of climate change and that the decarbonisation of the energy system is an important prerequisite in this context. Internationally, many countries plan to achieve decarbonisation by increasing energy efficiency and expanding renewable energy sources (RES), though these actions will involve significant investments in energy infrastructures. For example Slednev et al. (2017) quantify the large investment requirements for a range of different renewable electricity generation scenarios out to 2050 for Ireland to meet its long term decarbonisation targets. While people are generally found to express acceptance of these investments on a broader level, policy makers and planners are frequently met with resistance from local residents to specific energy infrastructure development proposals. Indeed, some politicians and renewable energy technology (RET) developers argue that this local resistance can be explained by 'NIMBYism' (Dear (1992), Wolsink (1994) and Burningham et al. (2015)) which suggests that people support such developments in general but object to them for selfish reasons when the planned developments affect their direct vicinity. This so-called NIMBY ('not in my backyard') explanation is, however, widely acknowledged in the literature as far too simplistic or invalid (see - Wüstenhagen et al. (2007) and Rand and Hoen (2017)).

Nevertheless, many studies identify the distance between the particular energy infrastructures and a person's home as one of the key factors affecting the local acceptance of different energy technologies (for example, Mueller et al. (2017), Warren et al. (2005) and Van der Horst (2007)). This so-called 'proximity hypothesis' implies that people are more likely to oppose the energy technology, the closer it is located to their residence. Thus far, studies have revealed some conflicting results in respect of the direction of the proximity effect with some research finding negative, positive or no proximity effects on peoples' attitudes to different energy technologies (see Mueller et al. (2017)). One explanation for the inconsistent results is related to the fact that peoples's preferences for proximity to energy infrastructures is not only concerned with spatial distance alone, but also with the various other factors correlated with spatial distance, for example, visual/landscape impact, noise/sound and health impact. In fact, spatial proximity to energy infrastructures is frequently used as a proxy for these other related variables in many different analyses. For example, distance is used to capture visual and health impacts in Fimereli et al.'s (2008) choice experiment and it is used as a proxy for local economic impacts in Van der Horst (2007). For this reason, it is important to understand which variables actually drive people's preferences for spatial proximity to different energy infrastructures where the overall aim is to engage in effective communication with the people who will ultimately be most affected by such infrastructure developments.

In this paper, the factors influencing people's preferences for spatial proximity to different energy infrastructure technologies are examined using a cross-country econometric analysis of the stated preference data from a pooled cross-section of three unprecedented surveys conducted in Ireland, Germany and the US. This survey is based on nationally representative samples of the population in Ireland, the US and Germany and involves more than 4,500 participants in total. The analysis aims at understanding the different drivers that shape people's preferences in relation to different energy infrastructure technologies, particularly focussing on the spatial proximity between developments and people's residences. Building on environmental psychological theory, this analysis differentiates between external (socio-demographic) and internal (attitudes, beliefs) factors driving people's attitudes towards the spatial proximity to different energy technologies. Furthermore, this paper will explore the factors affecting people's proximity preferences across a range of different energy technologies, which is a significant gap in the existing literature that impedes the comparability of studies across technologies (Rand and Hoen, 2017). These technologies are; wind turbines, solar power technology, biomass power plant, coal-fired power plant and natural gas power plant. Finally, it is the first study of its kind to analyse people's proximity preferences for these broad range of energy technologies across different countries with the main goal being to investigate for any heterogeneity in preferences across nations.

The remainder of the paper proceeds as follows: Section 2 presents a review of the related literature from environmental psychology and economics, Section 3 provides a description of the survey data used for the analysis, details of the ordered outcome methodology used for estimation are outlined in Section 4, results are presented in Section 5, a discussion follows in Section 6 together with a brief conclusion in Section 7.

2. Literature on Spatial Proximity

There is a widespread literature which conceptually examines and defines social acceptance in relation to different energy technologies. For example,Wüstenhagen et al. (2007) provide an introduction to three dimensions of social acceptance of renewable energy projects, namely socio-political, community and market acceptance. The authors differentiate between these three dimensions. They define socio-political acceptance as acceptance at the broadest, most general level, while they describe community acceptance as the specific acceptance of siting decisions for energy projects which involves the local stakeholders. In addition, market acceptance is referred to by the authors as the process of market adoption of a particular innovation or energy technology. As part of their review, Wüstenhagen et al. (2007) point out that it is within the arena of 'community acceptance' that the debate around NIMBYism unfolds whereby some authors argue that the difference between the general acceptance of energy technologies and then local opposition to specific energy projects is explained by the fact that people support such energy projects as long as it is not in their own backyard.

In a review of the previous literature on public perceptions of wind energy, where local opposition is typically characterised as NIMBY, Devine-Wright (2005) identifies six distinct strands of research in the area particularly with wind power systems, most notably two of these strands are; the physical proximity to turbines, and NIMBYism as an explanation for negative perceptions. Indeed, there are many studies on how the discourse of NIMBYism is enrolled within disputes about siting energy technologies. For instance, Burningham et al. (2015) conduct a series of semi-structured interviews with the key actors involved in the process of siting different energy technologies in the UK in 2007-2008 to explore the influence of the public on renewable energy development. They conclude that developers are 'heavily informed' by the NIMBY model and that local opposition equates to NIMBYism in the attitudes of developers towards resistance of such energy technologies.

In contrast, most of the literature argues against the notion that local opposition is the same as NIMBYism, with Wüstenhagen et al. (2007) asserting that NIMBYism is an oversimplification of people's actual motives for their resistance to the development of energy technologies in their vicinities. Ek (2005) and Wolsink (2007) also support the idea that the NIMBY explanation is too simplistic. In examining the general attitudes towards wind power among Swedish electricity consumers by employing a postal survey in 2002, Ek (2005) finds that respondents with wind power installations in sight of their residences have similar attitudes to respondents without any sight of these installations. Wolsink (2007) states that public attitudes to wind power are fundamentally different from attitudes towards wind farms and it is this gap that contributes to misunderstandings with regards to NIMBY. Furthermore, Firestone et al (2012) propose that NIMBY resistance may be a result of opposition, rather than an explanation of it. It is of particular note that in a recent review of the social acceptance literature for energy technology, Gaede and Rowlands (2018) suggest that the rapid growth in the study of social acceptance might explain the concerns raised over the 'coherence of core concepts like NIMBYism'. Additionally, Devine-Wright's 2005 review shows that many studies do not support the NIMBY hypothesis since the majority of these studies find that those opposed to wind energy locally are also shown to be not in favour of wind farms anywhere.

Given that it is generally accepted by researchers that the NIMBY explanation for resistance to renewable energy development is invalid, any attempt to measure a so-called NIMBY effect is challenging with its definition varying to a large extent with respect to many other factors such as spatial proximity. Van der Horst (2007) suggests that such variations influence the opinions expressed by respondents and make it difficult to accurately measure views on a project's proposed location. Also, the NIMBY concept is strongly linked to the 'proximity hypothesis', whereby those living closest to existing energy technology are expected to have the most negative attitudes towards it. Though, Rand and Hoen (2017) find that this hypothesis yields confounding findings in the literature and they argue that this is likely due to distance being correlated with other important factors i.e. sound and visual impacts.

In terms of distance to energy technologies, Bertsch et al. (2016) conducts a large nationally representative survey in Germany to analyse public acceptance of energy infrastructure and finds that distance between places of residence and places of energy infrastructure construction is crucial for acceptance. Additionally, there are a wealth of discrete choice experiments employed in this field to elicit the importance and value to the public of distance to different energy technologies. Fimereli et al. (2008) use a choice experiment to explore the effects of distance to wind, biomass and nuclear power on public preferences for the use of low carbon energy technologies in the UK. They discover that the location of energy technologies is a significant factor with respondents placing greater value on energy options located far from their homes. In a separate choice experiment in Germany, Meyerhoff et al. (2010) echo these findings and indicate that on average, people prefer to move wind turbines further away from residential areas. Most recently, Brennan and Van Rensburg (2016) find that if distance to wind turbines is increased from 500m to 1000m, the respondents to their discrete choice experiment in Ireland would require significantly less compensation (in the form of a discount in their electricity bill) per annum. Moreover, there are many other recent studies which find that wind farm visibility reduces local house prices (Gibbons (2015), Sunak and Madlener (2016) and Heintzelman et al. (2017)).

Also of relevance to this strand of literature, are the underlying motives that drive people's acceptance or opposition to the siting of energy technologies, which can too often be disregarded as NIMBYism. Utilizing a survey of 503 residents of a town in South West England on proposals to construct a high voltage power line in their vicinity, Devine-Wright (2013) finds that those respondents involved in NIMBY type action groups are more likely to indicate high levels of place attachment. In a contingent valuation survey developed to gain an understanding of perceptions of wind power and their influence on mountain views in North Carolina, Groothuis et al. (2008) show that individuals with concerns for the environment have less of a NIMBY reaction to windmills. Whereas using a qualitative analysis of responses to a choice experiment, Vecchiato (2014) reveals that in looking at the NIMBY effect; people are less likely to buy a house with a permanent view of a wind turbine from the windows.

While Warren et al. (2005) describes that much of the debate over windfarms and other energy technologies comes from 'location, location, location', they determine that the real issues are associated with landscape aesthetics where the preservation of valued landscapes motivates most of the opposition. In another study, Bishop and Miller (2007) stress that distance remains important because it determines the visual magnitude of such developments. For example, Bertsch et al. (2016) show that landscape modification is one of the most important factors influencing acceptance across all energy technologies in their analysis in Germany. Moreover, Rand and Hoen's 2017 overview of wind energy acceptance in North America suggests that sound and visual impacts are strongly linked to opposition against wind energy. Similarly, Fimereli et al. (2008) use distance from respondent's homes in their choice experiment to capture the visual impacts of the energy options together with the associated health impacts and safety issues.

Interestingly and in contrast to the above findings, Bertsch et al. (2017) find that, while concerns about the landscape or sound are significant predictors of people's opinions of energy technologies such as wind power in general, they do not significantly predict local opposition to any of the considered technologies in Ireland. Though, the authors do establish that the perception of health impact can be a significant driver of local opposition. Further to this, a national survey in the United States during 2016 found that wind turbines were overall seen to be favorable, with a positive impact on climate concerns, the economy, and local employment, although 37% of the survey participants felt there was a negative impact on changes in the landscape (Lawrence, unpublished). This study also indicated a neutral (neither positive or negative) impact on noise concerns.

3. Data and Variables

This paper uses micro-data collected in three separate online surveys conducted for Ireland, the US and Germany. The surveys were developed over a number of iterations and are based on stated preference questions with the overall aim to assess how willing people in each jurisdiction are to accept the development of energy infrastructure in their local communities. In the final iteration a nationally representative sample was drawn for each country. For Ireland, the online survey was conducted using a representative panel (n=1,414) drawn from the panel book of Research Now, an international company with approximately 54,000 panelists across Ireland. The Irish survey was conducted from the end of May to the beginning of June 2016. After an initial analysis of the two screening questions amongst other criteria included in the survey instrument to ensure data quality the final stage sample comprised of n=1,057 respondents. This sample is demographically representative in terms of gender, age, region and principal-economic status in Ireland. The online survey in the USA was undertaken in Spring 2016 using the survey service Qualtrics, a leading national panel provider. The survey is demographically nationally representative as well as representative in terms of regional distribution. The US study included 2,538 responses that were divided evenly across the major socio-economic regions (West, Midwest, South, Northeast). Finally, a representative panel for Germany was drawn (n=1,443) using the panel book of Consumerfieldwork GmbH, an international company with over 45,000 panellists across Germany. The final sample for Germany consists of n=912 respondents and is demographically representative in terms of age and state residence.

For the purposes of this study, the analysis is conducted on a pooled cross-section of all respondents across the three countries (n=4,507). This is to maximise sample size and more importantly provide the appropriate opportunity to investigate for country specific heterogeneity associated with peoples preferences for proximity to different energy infrastructures. Each survey was divided into a number of question categories most of which use a Likert scale response option. These questions are broadly consistent across the surveyed countries, though the measurements and scales of the responses varied depending on each country i.e. kilometres in both Ireland and Germany vs miles in the US. For this reason, kilometres and miles are assumed to be synonymous distances in the respondent's preferences for the minimum acceptable distance of the different energy technologies to their residences. Further to this and to account for any differences in the response options for the independent variables across countries, the country specific scales are combined into common scales for each country in the pooled sample.

3.1. Dependent variable

The dependent variable used in this study is derived from responses in the survey to the respondent's preference for the minimum acceptable distance of the separate energy technologies to their residences. These technologies include: wind turbines; solar power technology; a biomass power plant; a coal-fired power plant; and, a natural gas power plant. The variable is ordinal with outcomes of '0-1kms/miles', '1-5km/miles', '>5km/miles' and to 'reject regardless of distance'. Respondent's were also given the option to choose 'Don't know' as the outcome to their preferred minimum distance for each individual energy technology. These respondents are dropped from the analysis for each related energy technology and as a result the exact sample size differs from n=4,507 for each of the separate technology studies.

Figure 1 illustrates the proportion of respondents in each outcome category for the preferred minimum acceptable distance to each energy technology across the three countries. Overall, the respondents from all three countries are shown to be overwhelmingly opposed to having either of the two conventional energy technologies (coal and natural gas power plants) located at close distances to their residences with the vast majority of people choosing both the '>5km/miles' and 'reject regardless of distance' categories. Similarly, respondents in Ireland and the US are less willing to accept biomass power technology in their immediate vicinity with over 70% of people in both countries choosing either '>5km/miles' and 'reject regardless of distance' as their preferred outcome. On the basis of minimum distance, biomass power plants are the least popular renewable energy technology in the US, with acceptance distances similar to that of coal fired power plants, although a relatively large number of the US respondents (42%) had limited or no experience about biomass power plants. In contrast, German respondents are somewhat more accepting of biomass energy technology with 55% of German people accepting biomass at distances less than 5km/miles of their homes.

In comparison to the conventional energy technologies, Figure 1 shows that respondents from each of the three countries are more generally in favour of having renewable energy technologies located at closer distances to their private residences. Similar to biomass power technology, German respondents are also the most willing to accept solar power technology at close distances to their homes. In the German survey 74% of respondents showed a willingness for solar technology to be situated at 0-1km/miles from their residences compared to just 42% and 24% in Ireland and the US respectively. This could imply that German people have a better understanding of the requirement for solar technology to be located close to residences, especially in terms of rooftop solar. For wind technology, Ireland is shown to be the least willing to accept wind turbines at close distances with only 13% of Irish respondents in the sample choosing the minimum category of '0-1km/miles' as an acceptable distance to turbines and 15% choosing to reject wind turbines regardless of distance. Irish respondent's preferences for the minimum acceptable distance to wind turbines is followed very closely by the preferences from US participants, where 11% chose to reject wind technology regardless of distance. Again, as with the other renewable energy infrastructure, German people are the most willing to accept wind turbines sited near their homes with 33% choosing a minimum acceptable distance to wind turbines of '0-1km/miles' and only 9% choosing to reject wind turbines outright regardless of distance.

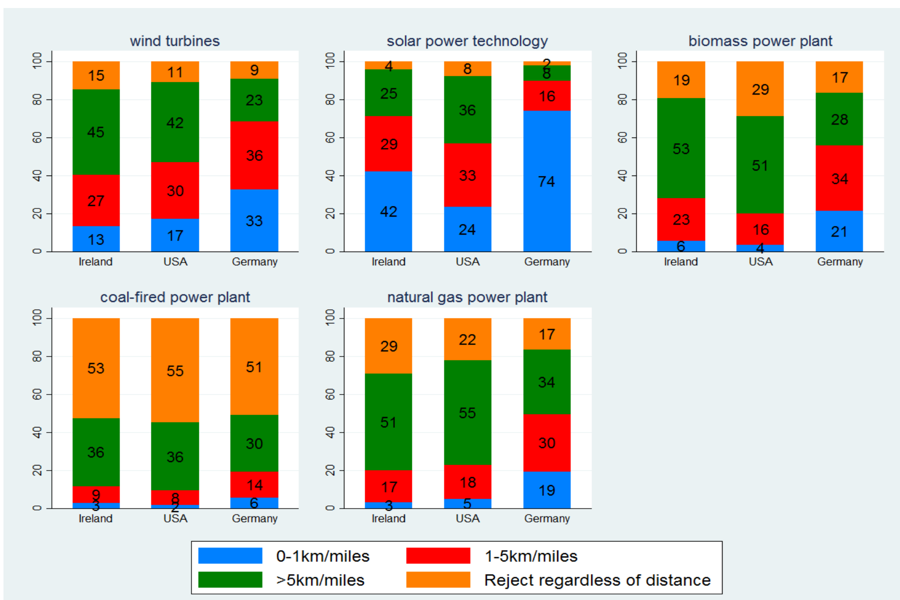

Figure 1: Minimum acceptable distance of the separate energy technologies from residence by country (%).

3.2. Independent variables

In terms of the independent variables for this study, the conceptual structure from Guagnano et al. (1995) is closely followed, with a clear distinction made between the external (demographic, economic, structural) and the internal (attitudes, beliefs) variables that drive people's attitudes towards the minimum acceptable distance of the different energy technologies examined.

For the external independent variables, the survey data for each country provides information on the respondent's socio-demographic characteristics. Table 1 presents the overall sample descriptive statistics for the socio-demographic variables, as well as the descriptive statistics split by country. Both age and dwelling tenure are categorical variables, while education is a binary variable equal to one if the respondent has a third level education. Respondents from the US make up the majority of the sample at 56% with Ireland at 24% and Germany at 20% of the overall sample. Each country's sample is representative in terms of age, though it is interesting to note that the US sample comprises of a larger older cohort (>55 years) and smaller younger cohort (<55 years) when compared to Ireland and Germany. Also of particular note is that both the samples from Ireland and the US consist primarily of homeowners, while the German sample is largely made up of renters which reflects the differences in living between the countries. In addition, the US sample has many more respondents that are educated at third level than Ireland or Germany.

Table 1: Descriptive statistics for external (socio-demographic) independent variables.

Variables	Ireland %	US %	Germany %	All Countries %
Country of Residence	23.45	56.31	20.24	100
Age				
15-34 years	32.92	14.89	20.39	20.24
35-44 years	18.07	10.44	17.54	13.67
45-54 years	15.33	14.11	20.29	15.64
55-64 years	14.10	25.57	15.02	20.75
≥65 years	19.58	34.99	26.75	29.71
Dwelling Tenure				
Homeowner	68.40	71.00	32.57	62.57
Renter	29.33	26.01	65.24	34.78
Other	2.27	2.98	2.19	2.65
Education				
Third level	20.81	57.88	22.81	42.09
Other	79.19	42.12	77.19	57.91
Observations	1,057	2,538	912	4,507

Table 2: Internal independent variables and their Likert categories.

Variables	Categories
National Energy Policy Preferences	
Tradeoff Economic Competitiveness vs.	
Environmental Sustainability	Generally less important
Reliability of Supply	Equally important
Social Acceptance	Generally more important
Tradeoff Environmental Sustainability vs.	
Reliability of Supply	Generally less important
Social Acceptance	Equally important
	Generally more important
Tradeoff Reliability of Supply vs.	
Social Acceptance	Generally less important
	Equally important
	Generally more important
Technology Specific Perceptions	
Landscape	Don't know
Sound	Generally negative
Health	Neutral
Local Economy	Generally positive
Local Employment	
Odour	
Air	
Water	

In this analysis, the internal independent variables are based on questions asked across all three surveys about participants' different attitudes and beliefs with respect to the separate energy technologies. Table 2 lists the different internal independent variables controlled for in this analysis together with their Likert categories. In the first instance respondents were asked for their preferences of and pairwise tradeoffs between different national energy policy objectives. Their preferences were elicited by asking them to tradeoff between the following energy policy objectives: economic competitiveness; environmental sustainability, reliability of energy supply; and, social acceptance. Indeed, there is strong evidence in the literature that such political preferences are related to people's opinions of energy technologies, for example, Dietz et al. (1998) find that the tradeoff between the economy and the environment is a significant factor in people's opinions (see - Bertsch et al. (2017); Hyland and Bertsch (2018) for more examples). Figure 2 looks at the pairwise tradeoffs and shows that people in Ireland place much more importance on environmental sustainability, reliability of supply and social acceptance rather than economic competitiveness. In fact, Irish citizens are also found to rank social acceptance as more important than either environmental sustainability or reliability of supply. Opposite to this, German people rank all the national policy objectives examined as more important than social acceptance, though similarly, they place a greater importance on environmental sustainability and reliability of supply than economic competitiveness. Moreover, people from the US place a much lower importance on social acceptance as a national policy objective compared to the other three policy objectives. Thus, social acceptance is shown to be a more significant energy policy concern for Ireland compared to either Germany or the US.

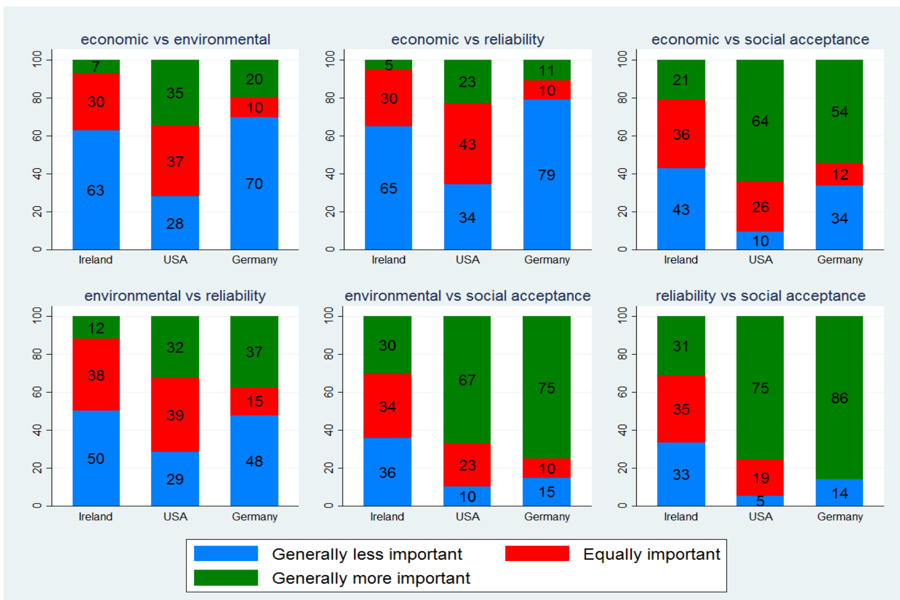

Figure 2: Pairwise tradeoffs between national energy policy preferences by country (%).

Further to their pairwise tradeoffs between national energy policy preferences, respondents were also asked for their perceived impact assessments of the different energy technologies on various technology-specific criteria, for example, the impact of a particular energy technology on the landscape, on people's health or on the local economy. The participant's responses are based on four categories, these are; 'Don't know'; 'Generally negative'; 'Neutral'; and, 'Generally positive'. Figure 3 shows the percentage of participants in each response category for their perceived influence of the separate energy technologies on the landscape split by country. It is evident that across the three countries a coal-fired power plant is considered by the majority of respondents to have a generally negative impact on the landscape. Furthermore, wind turbines and natural gas power plants are also deemed by participants across countries to have a predominantly negative impact on the landscape with the exception of the natural gas power plant in the US, which is considered to have a neutral impact on the landscape by 37% of people there. Interestingly, solar power technology is viewed by 60% of participants in Ireland to have a generally positive impact on the landscape, while just 36% of respondents in the US and 18% of respondents in Germany perceive there to be a generally positive impact on the landscape from solar technology. The perceived impact of biomass power technology on the landscape follows a somewhat similar trend to solar technology across countries, though slightly less positive in general.

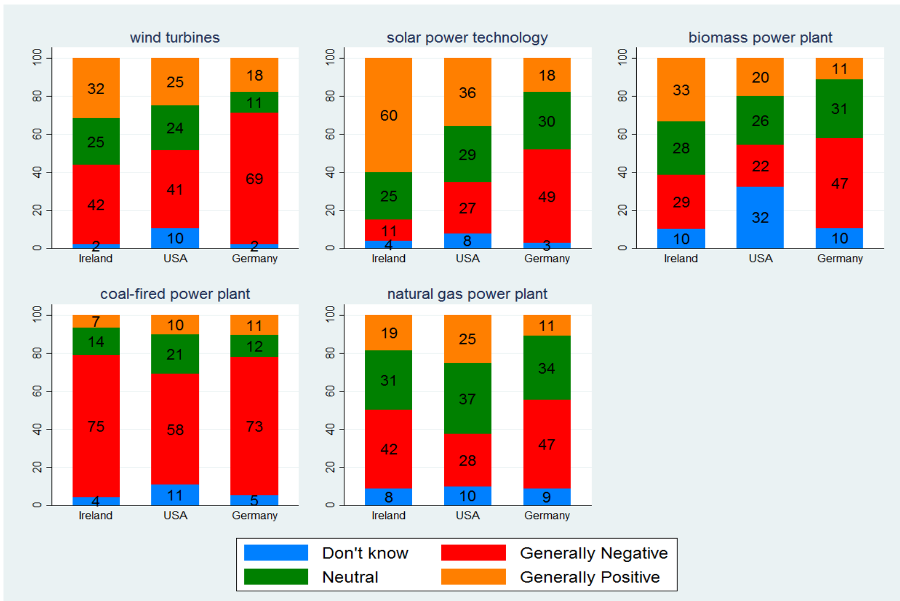

Figure 3: Perceived influence of the separate energy technologies on the **landscape** by country (%).

Additionally, Figure 4 and Figure 5 illustrate the proportion of participants by country in each response category for their perceived influence of the separate energy technologies on people's health and on the economy respectively. For the impacts on health in Figure 4, coal-fired power plants are considered by the largest majority to have a negative influence on health with over 70% of participants in each country choosing the 'Generally negative' response option. On the contrary, most respondent's in each country perceive there to be either a neutral or positive influence on health from both wind turbines and solar technology. In respect of the perceived impacts to the local economy in Figure 5, the greatest number of participants in each country consider all energy technologies to have either a neutral or generally positive influence on the local economy, though remarkably, 27% of Irish participants perceive coal-fired power plants to have a generally negative impact on the economy. Approximately the same proportion of US respondents (32-34%) chose the 'Don't know' option for the perceived influence of biomass technology on the landscape, health and the economy.

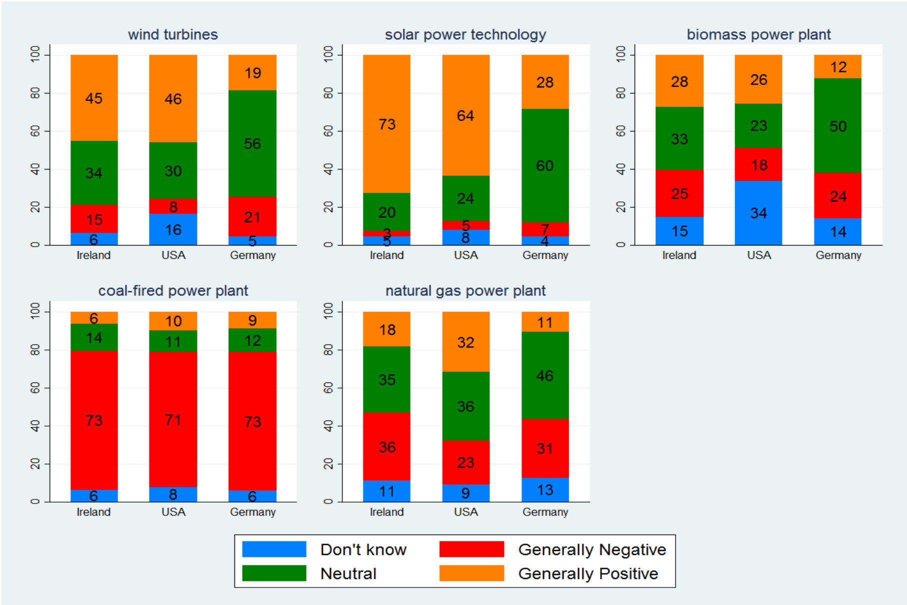

Figure 4: Perceived influence of the separate energy technologies on **health** by country (%).

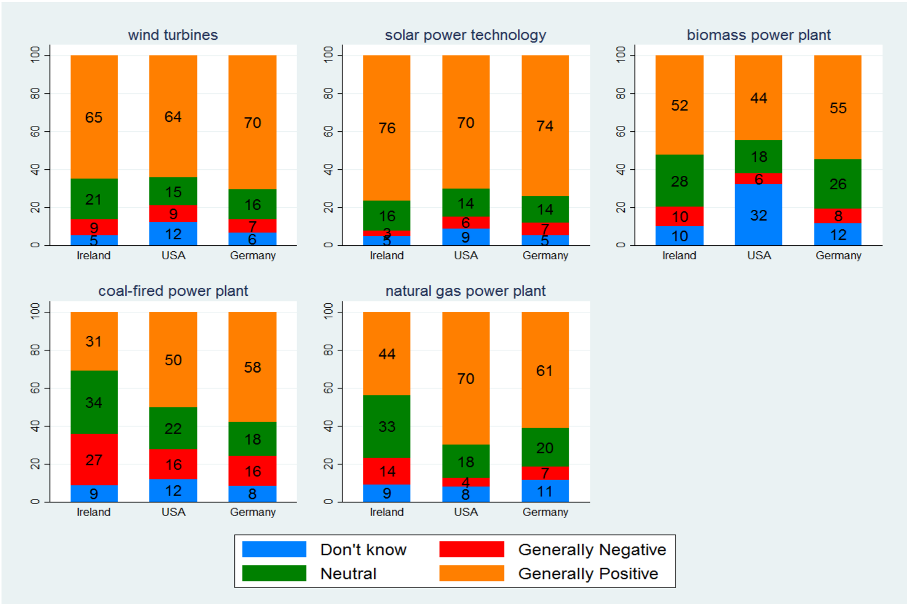

Figure 5: Perceived influence of the separate energy technologies on the **local economy** by country (%).

4. Methodology

The stated preference of respondent i to accept energy technology n at a distance from their place of residence (Y_{in}) is modelled as a function of a vector of the respondent's socio-demographic variables (X_i), a vector of the respondent's national energy policy preferences (P_i) and a vector of the respondent's technology-specific perceptions (S_{in}), such that:

$$Y_{in} = f(X_i, P_i, S_{in}, \epsilon_{in}) \tag{1}$$

(Y_{in}) is an ordered outcome variable taking on $m = 4$ alternatives, where 1 is 'accept at 0-1km/miles', 2 is 'accept at 1-5km/miles', 3 is 'accept at >5km/miles' and 4 is 'oppose regardless of distance'. The variables included in X_i, are the individual characteristics of each respondent and include their country of residence, age category, dwelling tenure and an indicator variable for whether or not they have a third level education. P_i includes categorical variables for the general importance respondents place on different pairwise national energy policy tradeoffs. Some examples include; economic viability versus environmental sustainability, environmental sustainability versus social acceptance, and the reliability of electricity supply versus social acceptance. The variables included in S_{in} are also categorical variables describing the respondents' perceived impacts from energy technology n on different factors such as: the landscape, air, water, health, the economy and local employment. ϵ_{in} is a stochastic error term.

At first, an ordered logit model was considered to account for the ordered nature of the dependent variable, however this model requires that the proportional odds assumption (POA) holds (see - Long and Freese (2006) for a detailed explanation). To check for the POA, tests described by Williams (2006) were performed and in all cases there was a violation of the POA, thus a generalised ordered logit model is instead employed. The generalisation of the ordered logit model allows the coefficients on the independent variables to differ for different levels of the dependent variable.

The model defines $P_{in} = P(Y_{in} > j)$ as the probability that respondent i accepts the energy technology n at a distance alternative greater than $j = 1, ..., m-1$. Under the assumptions of the generalised ordered logit model $P_{in} = \Lambda(\boldsymbol{X'}\beta_j)$, where $\Lambda(.)$ represents the logistic distribution function (i.e. $\Lambda(\boldsymbol{X'}\beta_j) = \frac{exp(\alpha_j + \boldsymbol{X'}\beta_j)}{1+exp(\alpha_j+\boldsymbol{X'}\beta_j)}$), β_j is a vector of parameters for each alternative j and the vector $\boldsymbol{X}$ includes X_i, P_i and S_{in}. Estimation provides $\hat{\beta}_j$, unbiased estimates of the model coefficients β_j. The $\hat{\beta}_j$ coefficients are then converted to average partial effects. The average partial effects represent the change in probability that a respondent will report a specific distance preference for energy technology n when the value of a particular independent variable increases by one unit holding all other covariates constant. These partial effects capture the average effect across respondents.

5. Results

The results of the generalised ordered logit models are presented in Tables 3-7 for the five separate energy technologies, namely; wind turbines, solar power plants, biomass power plants, coal-fired power plants and natural gas power plants. Each table presents the estimated average partial effects of the independent variables on the respondent's stated preferences for the minimum distance to each energy technology from their place of residence as measured by the dependent variable. The standard errors are reported in parenthesis. First, the results for the renewable energy technologies, wind, solar and biomass are presented in Tables 3, 4 and 5 respectively. Then, the results for the two conventional energy technologies, coal and natural gas, are presented in Tables 6 and 7.

Further to this, Table 8 presents results from three models for the estimated average partial effects on the respondent's preferences for the minimum acceptable distance between wind turbines and their homes. This provides an example to demonstrate the relevance of the independent variables to the model and the improved model fit as a direct result of their inclusion. The first model controls for the respondent's socio-demographic characteristics, while the second model includes the socio-demographic characteristics together with the respondent's tradeoffs between the national energy policy preferences and finally the third model also includes the respondent's different technology-specific perceptions as well as the other variables included in model (2). An examination of the estimated partial effects across all three models highlights the importance for the inclusion of the respondent's national energy policy preferences and their technology-specific perceptions in the model. More specifically, the final model has a Likelihood Ratio of 998, up from 283.72 in model(1), which suggests that the additional variables lead to a large improvement in the fit of the model.

5.1. Wind turbines

The results in Table 3 for wind turbines show that German respondents are considerably more likely to accept wind turbines located at 0-1km/miles of their residences and less likely to accept them located at distances greater than 5km/miles when compared to their American counterparts. On the other hand, Irish respondents are estimated to have no significant difference to the American respondents for their likelihood of acceptance of the distance of wind turbines. In looking at the other socio-demographic variables, the results show that the age and education of the respondent does not matter to the acceptance of turbines at any distance, while dwelling tenure is shown to influence acceptance to a certain extent. Both renters and others are found to be more likely to accept turbines close by at 0-1km/miles than homeowners and less likely to oppose wind turbines altogether.

In terms of the respondent's national energy policy preferences, the results demonstrate that the tradeoff between economic viability and environmental sustainability is the most significant of all the policy tradeoffs examined for the minimum distance for which wind turbines would be accepted. People for whom economic viability is equally or generally more important than environmental sustainability are found to be less likely to accept wind turbines at close distances to residences and more likely to oppose turbines regardless of location from residences. Similarly, people who consider economic viability to be more important than the reliability of electricity supply are also found to be more likely to oppose turbines outright. Alternatively, people who value environmental sustainability as being more important than both the reliability of electricity supply and social acceptance are estimated to be less inclined to oppose wind turbines irrespective of distance. Furthermore, those who rank environmental sustainability as more important than reliability of supply are also more likely to accept turbines closer to their homes.

In considering how technology-specific perceptions affect respondent's acceptance of the location of wind turbines, the results provide evidence that the influence of wind turbines on the landscape, sound, health, the economy and local employment are all significant factors. People who subjectively assess turbines to have a neutral or generally positive effect on sound, health and the economy compared to a generally negative effect are less likely to oppose wind turbines regardless of distance. In addition, those people who perceive turbines to have a positive impact on the landscape, sound, health and local employment are more likely to accept turbines at nearer distances.

5.2. Solar power technology

Relative to respondents from the US in Table 4, respondents from Ireland and Germany are significantly more likely to accept solar power technology at a minimum distance of 0-1km/miles to their residences and less likely to oppose solar technology altogether. German respondents are also found to be less inclined to accept solar technology at intermediate distances of 1-5km/miles or greater than 5km/miles, and this could point to the Germans possibly having more familiarity with rooftop and dwelling level solar technology and their awareness of the requirement to have the panels located nearby. Identical to the findings for wind turbines, dwelling tenure is estimated to have a significant association with solar technology acceptance with renters and others less likely to oppose and more likely to accept solar technology at 0-1km/miles compared to homeowners. Age is not an important predictor of the acceptance of solar technology, though for education, people with at least a third level education are in favour of accepting the technology at 0-1km/miles relative to people with no third level education.

Looking at the national energy policy preferences for solar power technology, the results are similar to the findings for wind turbines. They show that people who rank economic viability as equally or more important than environment sustainability are more likely to oppose solar technology at any distance. Alternatively, people who believe economic viability to be more important than social acceptance are less likely to oppose solar. For the tradeoffs between environmental sustainability and both reliability of supply and social acceptance, like for wind turbines, people who consider the environment more important are significantly more likely to accept solar technology at minimum distances of 0-1km/miles. Furthermore, they are associated with being less likely to oppose the technology outright, though for environmental sustainability versus social acceptance, the partial effect is only borderline statistically significant.

In terms of the technology specific perceptions for solar power technology, the analysis found that people with the belief that solar technology has a generally positive influence on the landscape, health and the economy as opposed to a generally negative influence are more likely to accept solar at the very close distance of 0-1km/miles. Additionally, for the case of a perceived positive influence on health quality or the economy, people are also found to be less likely to oppose solar.

5.3. Biomass power plant

Similar to the findings for solar power technology, the results in Table 5 estimate that Irish and German people are more accepting of a biomass power plant at closer distances to their places of residence than American people while at the same time they are also less opposed to biomass energy technology irrespective of distance. Unlike the other renewable energy technologies, age is a significant predictor of the acceptance of a biomass power plant with respondents younger than 65 years old found to be less likely to accept biomass nearby their homes and more likely to oppose the technology at any distance from their homes.

It is of particular note that the tradeoffs in the national energy policy preferences are overall much less important for the acceptance of a biomass power plant than for the other renewable technologies with one exception, people who consider economic viability to be equally or more important than environmental sustainability are estimated to be more opposed to biomass technology regardless of distance.

Much like the previous technologies, the impacts of technology-specific perceptions on people's acceptance of a biomass power plant are somewhat comparable. People who subjectively assess biomass technology to have a neutral or generally positive impact on the landscape, air, water and the economy are either less opposed to the technology or more in favour of it being located nearby their residences. In the case for a perceived positive impact on health, people are significantly less opposed to and considerably more accepting of biomass in their immediate vicinities.

5.4. Coal-fired power plant

Most of the socio-demographic variables controlled for in the analysis are found to be insignificant for the local acceptance of a coal-fired power plant (see Table 6), though remarkably, the results indicate that both the respondents from Ireland and Germany are statistically more likely to accept the siting of a coal plant close to their place of residence relative to the respondents from the US. In fact, the estimated average partial effect shows that Irish people are also less likely to oppose such a development entirely compared to American people.

Of the national energy policy preferences, the tradeoff between economic viability and environmental sustainability together with the tradeoffs between environmental sustainability and both reliability of supply and social acceptance are found to be significant factors for the acceptance of a coal-fired power plant. In contrast to the renewable energy technologies, people who believe economic viability to be more important than environmental sustainability are less inclined to oppose a coal plant regardless of distance, while people who rank environmental sustainability as more important than both reliability and social acceptance are more inclined to oppose a coal plant.

Turning to the effects of the technology-specific perceptions on the acceptance of a coal-fired power plant, the results signal that people that perceive the impact of a coal plant on the landscape to be neutral or generally positive are less likely to oppose a coal plant and more likely to accept the plant closer to their residences. Somewhat similarly, a perceived positive impact from a coal plant on the economy makes it less likely for people to oppose such a technology. Additionally, people who judge a coal plant to have a neutral influence on the air, water and health quality are also less likely to oppose and more likely to accept the technology at close distances.

5.5. Natural gas power plant

More interestingly from the results in Table 7 and in line with the results for a coal-fired power plant, people from Ireland and Germany are less likely to oppose a natural gas power plant at any distance relative to American people, while German people are also estimated to be much more likely to accept a natural gas power plant than their US counterparts at the closest distance of 0-1km/miles from their residences. In terms of the respondent's age, younger people (under 55 years old) are found to be more inclined to oppose a natural gas power plant and less inclined to accept the technology at nearer distances. Also from the results, renters are more likely to accept the natural gas technology at a minimum distance of 0-1km/miles than homeowners, and people with a third level education are less likely to oppose it overall.

In comparison to the findings for a coal-fired power plant, peoples' national energy policy preferences are revealed to be less relevant to their acceptance of a natural gas power plant. The results reveal that only the tradeoff between environmental sustainability and social acceptance matters for the acceptance of natural gas technology with people who rank the environment as generally more important than social acceptance found to be less disposed to accepting a natural gas power plant located close to their residences at 0-1km/miles.

Finally, the results provide evidence that technology-specific perceptions also affect people's acceptance of a natural gas power plant. People who subjectively assess the impact of a natural gas plant to be generally positive on air, water and health are less likely to oppose and more inclined to accept the technology at close distances. Moreover, those who consider the natural gas technology to have a neutral effect on the landscape are found to have the same result for acceptance. Somewhat surprisingly, if people believe that a natural gas power plant will have a positive impact on the local economy, they are found to be less inclined to accept the technology at a distance of 0-1km/miles, though they are also less likely to oppose the technology regardless of distance.

6. Discussion

In general, this analysis shows that German and Irish citizens are more willing to accept different energy technologies at smaller distances to their homes than their US counterparts. For the five energy technologies examined, including both renewable and conventional energy technologies, people from Germany are revealed to be much more willing to accept any of the power generating technologies at distances of 0-1km/miles to their residences compared to people from the US. Likewise, people from Ireland have an increased likelihood of acceptance for all technologies at distances between 0-1km/miles, except for wind turbines, where no statistically significant difference was found between Irish citizens and US citizens. Of all the renewable energy technologies, wind turbines have established, by far, the largest presence in Ireland and it is therefore a technology with which Irish people are mostly familiar. This familiarity combined with the fact that several high profile objections to wind farm siting decisions have been made across Ireland, could explain this finding compared to the result for Germany. Specifically, the objections to the siting decisions in Ireland may have created an awareness around the issue of wind turbines and started a 'process of thinking' as described by Wolsink (2007).

Furthermore, German and Irish citizens are shown to be less likely to oppose solar power, biomass power or natural gas power technology regardless of distance, while remarkably, Irish people are also found to be less likely to oppose coal-fired power technology. It may be that the German population has a somewhat deeper awareness of the overall requirements for the energy transition to a low carbon economy, and thus realise the necessity of renewable energy infrastructures or natural gas technology (in its transitional capacity) to achieving this end. Indeed, results from Scheer et al. (2013) determine that there are considerable differences between US and German citizens in relation to their technology preferences for achieving a low carbon electricity generation system with German participants from their survey found to be noticeably more in favour of renewable energy technologies. Thus, the preferences around the minimum distance to energy technologies are embedded in the wider social, economic and geographic context for each country.

On the other hand, it could be argued that land mass may have an important role to play in the overall local acceptance of energy technologies across countries. It is hypothesised that since the US has ample space available away from private residences for the construction of different energy infrastructures, there is less need to have such technologies located at close distances to residences. Consequently, people from the US may have a larger distance preference for the acceptance of the separate energy infrastructures than, for example, people from Germany or Ireland, where space availability is a much larger concern given the lower land mass in each country relative to the US.

The large heterogeneity found between the three countries in the preferences for the minimum acceptable distance between the energy technologies and the respondent's homes in this study is consistent with other studies of acceptance which find heterogeneous views across nations. One example is the heterogeneity found in Cohen et al.'s (2016) study which empirically tests the effect that auxiliary positive information has on the level of acceptance for new transmission lines across the EU27 countries. They show large differences across nations in overall acceptance levels, as well as heterogeneity between nations for the probability of a 'definitely not accept without opposition' response and for the propensity to change this response based on the auxiliary information provided.

Regarding the other socio-demographic variables, the results show that there is much heterogeneity in the effects across the separate technologies and this reiterates the findings from Devine-Wright (2013) that the impacts of socio-demographics on acceptance can be highly context dependent. In exploring the effect of dwelling tenure, renters are found to be more likely to accept wind turbines, solar technology and a natural gas power plant at a minimum distance of 0-1km/miles to their place of residence when compared with homeowners. It could be suggested that renters may have less affinity with, or 'place attachment' to a locality compared to homeowners given that they do not confront the same restrictions for moving residence that homeowners face and so, the smaller distance preferences of renters may be expected to some extent.

According to the results, age is a significant predictor of the acceptance of a biomass power plant or a natural gas power plant, though age is not found to matter for the other technologies studied. Younger respondents are revealed to be less likely to accept biomass or natural gas power plants at close distances to their homes and more likely to oppose them outright. Though age has been identified as a significant factor in many international studies exploring the acceptance of energy infrastructures, most find the opposite with older people shown to be less accepting of such infrastructures, though none of these studies explored either biomass or natural gas technologies. For example, Cohen et al. (2016) show that older residents are on average less accepting of new transmission lines. In addition, higher educational attainment is recognised by Devine-Wright (2013) to influence strong objections to a high voltage power line in England. In comparison, this analysis shows that respondents with a third level education are less likely to oppose a natural gas power plant regardless of distance and more willing to accept solar power technology at 0-

1km/miles from their homes. Related to this, both age and education were also found to be significant predictors of preferences on low carbon electricity generation technologies in Germany and the US in the study conducted by Scheer et al. (2013).

Comparable to the previous literature (Groothuis et al. (2008), Bertsch et al. (2016), Bertsch et al. (2017) and Rand and Hoen (2017)), this analysis also reveals that environmental concerns are more important for peoples's preferences for the minimum acceptable distance to different energy infrastructures than any other national energy policy objective. People who value environmental sustainability as more important than economic competitiveness are established to be less inclined to oppose the three renewable technologies (wind, solar and biomass) regardless of distance and more inclined to oppose a coal-fired power plant. Similarly, where people rank environmental sustainability as a more important policy objective than the reliability of electricity supply or social acceptance, they are also found to be less likely to oppose wind and solar technologies and more likely to oppose a coal plant.

For the acceptance of energy technologies at close distances of 0-1km/miles to people's residences, the policy tradeoff between environmental sustainability and social acceptance is the most important driver. People are shown to be more willing to accept wind turbines and solar technologies at 0-1km/miles when they place a higher importance on environmental concerns rather than social acceptance. These same people are also found to be less willing to accept a natural gas plant at the distance interval of 0-1km/miles. Overall, people who prioritise environmental concerns as a national policy objective have a greater acceptance for renewable energy infrastructures on their doorsteps rather than for the conventional and much less clean technologies of coal and natural gas.

More generally, people's technology specific perceptions are also found to be significant drivers for their preferences for the minimum acceptable distance between the individual technologies and their homes. For all five energy technologies examined here, the perceived influence on the landscape, health and the economy are determined to be important factors. A perceived negative influence on the landscape or on health is associated with people being less willing to accept each separate technology at a distance of 0-1km/miles, while a perceived negative influence on the economy is related to a higher likelihood of opposing each technology outright. Not surprisingly, sound is an influential factor for preferences around the siting of wind turbines with a perceived negative influence on sound resulting in a lower willingness to accept turbines at close distances. Additionally, the perceived impact of biomass, coal and natural gas technology on air and water quality are also shown to be relevant to people's preferences for the location of these energy infrastructures. If people assess the influence on water or air quality to be negative, they are more likely to oppose the related technologies regardless of distance and less likely to accept them at close distances to their homes.

Most of the previous literature is primarily concerned with people's attitudes with respect to wind turbines, whereas this study shifts the focus more broadly onto other energy technologies together with wind. The findings concerning the influence of people's technology perceptions on their preferences for the acceptable distance to different energy technologies are, for the most part, in agreement with the findings in the related literature for wind turbines. The results concur with Rand and Hoen (2017) in demonstrating that sound and landscape impacts are linked strongly to the opposition of wind turbines. Though Wolsink (2007) argues that wind power opposition is more likely due to landscape objections rather than noise. Further to this, a key finding from Vecchiato's (2014) choice experiment suggests that people prefer to limit the visibility of wind turbines in terms of location and distance to help mitigate against a landscape impact and the results here lend further credibility to this finding.

Similarly, the results in this analysis infer that people prefer to limit the visibility of all energy technologies by choosing not to accept them at close distances when they are perceived to have a negative influence on the landscape. This echoes the finding in Bertsch et al. (2016) for Germany, where landscape modification is found to be one of the most important factors influencing acceptance across the technologies there. On the contrary, for Ireland, Bertsch et al. (2017) show that neither concerns about the landscape nor sound are significant predictors of local opposition to any of the energy technologies examined, however, they utilised the overall and broader concerns for each criteria (landscape and sound) rather than concerns related directly to the influence of the separate technologies studied. Moreover, health and environmental concerns are highlighted by Poortinga et al. (2006) to be the most important factors for deciding which methods of electricity generation should be used in the UK. Likewise in this study, the perceived impacts of the different energy technologies on health, air and water quality are revealed to be significant concerns in the acceptance or opposition to people's preferred locations across the three countries (Ireland, US, Germany). In addition to supporting the findings from the previous literature, this study also emphasises the implications that the perceived impacts on the economy has for the local acceptance of all technologies.

In terms of the policy implications from this analysis, it is clear that policymakers need to be aware that people's preferences for the minimum distance between different energy infrastructures and their homes are embedded in the broader social, economic and geographic environments of their respective countries. Policymakers could learn much from the heterogeneity found in people's preferences across the three countries examined here, since it casts some light on the influence that a country's institutions and social norms might have for its citizen's preferred location for different energy technologies. Furthermore, policymakers could benefit from an understanding of the overall energy policy objectives that are most important to people when they consider the proximity of energy technologies close to their homes. Policymakers need to communicate effectively about what objectives energy siting policies aim to achieve and in return this could enable more positive outcomes. Similarly, it is useful for policymakers to understand what technology-specific factors are related to people's preferences for proximity to the individual energy technologies. As a result of this information, related policies could be tailored to the specific concerns that are of most importance.

7. Conclusion

This paper presented a micro-econometric examination of the factors influencing people's preferences for spatial proximity to different energy infrastructure technologies. It used a pooled cross-section of the stated preference data from three unique surveys conducted in Ireland, Germany and the US to explore the influence of people's socio-demographics together with their technology-specific perceptions and national energy policy tradeoffs on their preferences for proximity to a range of energy technologies. In addition, the analysis also investigated for any evidence of heterogeneity in preferences for spatial proximity to these energy technologies across nations.

Overall, based on the results it is evident that people's preferences for spatial proximity between various energy technologies and their homes are driven by some very influential factors, such as their tradeoffs between national energy policy preferences, their technology specific perceptions and to a lesser extent their socio-demographic characteristics. Furthermore, the most important finding from this study is that a person's country of residence also has a role in shaping their location preferences for all technologies. In general, German and Irish citizens are found to be more willing to accept energy infrastructures at smaller distances to their homes than their US counterparts. Moreover, attitudinal factors shape people's preferences more consistently than any socio-demographic characteristics. Accordingly, this provides further evidence in support of the idea that the NIMBY explanation is too simplistic. Though with the 'proximity hypothesis' so closely related to NIMBY, and distance strongly correlated with other important factors for local acceptance, the range of motives found in this analysis that drive people's preferences for the siting of different energy technologies can still too often be disregarded as NIMBYism. Nevertheless, the location of energy technologies remains a significant concern for many people with their preference to move energy technologies further away from their places of residence.

From an empirical perspective there are some limitations to this analysis, for instance, omitted variable bias could be an issue here. Other relevant determinants of people's preferences for distance to energy technologies could not be captured in this analysis because the data was constrained by the availability of certain variables. For example, place attachment is a significant factor for the acceptance of energy technologies (Bidwell (2013) and Devine-Wright (2011)), though place attachment was not explored in any of the surveys used for the purposes of this study. Furthermore, it should be noted that this analysis is based on stated preferences and consequently, the extent to which people's stated preferences align with observed actions might have implications for the results. Finally, for the dependent variable, the assumption that kilometres and miles are synonymous in distance is acknowledged as a limitation of the study. This assumption is required for the cross-country comparison of people's proximity preferences and it does not affect the main findings. In fact, it could be argued that converting miles into kilometres would strengthen the existing results given that people's preferences for proximity to energy technologies would differ by even more between Ireland and Germany on the one side and the US on the other side.

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Tables

Table 3: Drivers of the stated preferences for the minimum distance of **wind turbines** from place of residence

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Socio-demographic Characteristics				
Country of Residence				
US	*Ref*	*Ref*	*Ref*	*Ref*
Ireland	-0.014	-0.012	0.016	0.010
	(0.012)	(0.010)	(0.013)	(0.008)
Germany	0.189***	0.047*	-0.236***	0.000
	(0.021)	(0.020)	(0.019)	(0.013)
Age of Respondent				
15-34 years old	0.004	0.002	-0.003	-0.002
	(0.013)	(0.007)	(0.012)	(0.008)
35-44 years old	-0.034	-0.011	0.063**	-0.019
	(0.017)	(0.020)	(0.023)	(0.014)
45-54 years old	-0.019	-0.011	0.017	0.012
	(0.013)	(0.007)	(0.012)	(0.009)
55-64 years old	0.023	0.010	-0.020	-0.013
	(0.013)	(0.006)	(0.011)	(0.007)
$\geq$65 years old	*Ref*	*Ref*	*Ref*	*Ref*
Dwelling Tenure				
Own	*Ref*	*Ref*	*Ref*	*Ref*
Rent	0.058***	-0.016	-0.012	-0.031**
	(0.014)	(0.016)	(0.017)	(0.010)
Other	0.106**	0.040***	-0.095**	-0.051***
	(0.036)	(0.007)	(0.030)	(0.013)
Third level education	-0.007	-0.004	0.006	0.004
	(0.009)	(0.005)	(0.009)	(0.006)

Continued on next page

Table 3 (wind turbines) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
National Energy Policy Preferences				
Tradeoff Econ vs. Env				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.038**	-0.020**	0.036**	0.022**
	(0.012)	(0.007)	(0.012)	(0.007)
Generally more important	-0.047***	-0.026***	0.045***	0.028***
	(0.012)	(0.007)	(0.012)	(0.008)
Tradeoff Econ vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.012	-0.007	0.012	0.007
	(0.011)	(0.006)	(0.011)	(0.007)
Generally more important	0.002	-0.013	-0.035	0.045**
	(0.018)	(0.020)	(0.022)	(0.016)
Tradeoff Econ vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.023	0.014	-0.022	-0.015
	(0.014)	(0.008)	(0.013)	(0.009)
Generally more important	0.032*	0.018*	-0.030*	-0.020*
	(0.013)	(0.008)	(0.012)	(0.008)
Tradeoff Env vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.017	0.010	-0.016	-0.011
	(0.012)	(0.007)	(0.011)	(0.007)
Generally more important	0.037**	0.020**	-0.035**	-0.022**
	(0.013)	(0.007)	(0.012)	(0.007)
Tradeoff Env vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.000	-0.000	0.000	0.000
	(0.016)	(0.009)	(0.014)	(0.012)
Generally more important	-0.001	0.035*	0.009	-0.043***
	(0.017)	(0.017)	(0.019)	(0.013)
Tradeoff Rel vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.021	-0.012	0.020	0.013
	(0.018)	(0.010)	(0.017)	(0.011)
Generally more important	0.002	0.001	-0.002	-0.001
	(0.016)	(0.008)	(0.015)	(0.009)

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Table 3 (wind turbines) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Technology Specific Perceptions and Preferences				
Landscape				
Don't know	0.032	0.021	-0.033	-0.020
	(0.022)	(0.012)	(0.022)	(0.013)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.061***	0.034***	-0.060***	-0.035***
	(0.012)	(0.006)	(0.012)	(0.006)
Generally positive	0.071***	-0.028	-0.042*	-0.001
	(0.016)	(0.017)	(0.020)	(0.014)
Sound				
Don't know	0.075***	0.041***	-0.071***	-0.045***
	(0.022)	(0.009)	(0.020)	(0.011)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.056***	0.034***	-0.054***	-0.036***
	(0.011)	(0.007)	(0.011)	(0.007)
Generally positive	0.061***	0.036***	-0.059***	-0.039***
	(0.014)	(0.008)	(0.013)	(0.008)
Health				
Don't know	0.025	0.028	-0.024	-0.030
	(0.017)	(0.018)	(0.016)	(0.019)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.076***	0.066***	-0.073***	-0.069***
	(0.011)	(0.012)	(0.011)	(0.013)
Generally positive	0.125***	0.056**	-0.076***	-0.105***
	(0.016)	(0.019)	(0.020)	(0.016)
Economy				
Don't know	-0.012	0.011	0.090*	-0.089**
	(0.036)	(0.036)	(0.037)	(0.031)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	-0.037	0.065*	0.077*	-0.105***
	(0.030)	(0.032)	(0.031)	(0.025)
Generally positive	0.007	0.105***	0.060*	-0.172***
	(0.027)	(0.028)	(0.028)	(0.024)
Local employment				
Don't know	0.037	0.024	-0.035	-0.026
	(0.022)	(0.015)	(0.021)	(0.016)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.030	0.020	-0.029	-0.021
	(0.017)	(0.012)	(0.016)	(0.013)
Generally positive	0.045**	0.028*	-0.043**	-0.030*
	(0.016)	(0.012)	(0.016)	(0.013)

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Table 3 (wind turbines) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose

Based on a sample of 3,989 respondents
Likelihood Ratio χ^2 998.00
***p<0.01, **p<0.05, *p<0.1

Table 4: Drivers of the stated preferences for the minimum distance of **solar power technology** from place of residence

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Socio-demographic Characteristics				
Country of Residence				
US	*Ref*	*Ref*	*Ref*	*Ref*
Ireland	0.190***	0.004	-0.150***	-0.044***
	(0.020)	(0.005)	(0.015)	(0.005)
Germany	0.504***	-0.170***	-0.284***	-0.050***
	(0.020)	(0.015)	(0.015)	(0.008)
Age of Respondent				
15-34 years old	0.002	-0.000	-0.001	-0.001
	(0.018)	(0.000)	(0.013)	(0.005)
35-44 years old	-0.041*	-0.001	0.031*	0.011*
	(0.019)	(0.001)	(0.014)	(0.006)
45-54 years old	-0.036*	-0.001	0.027*	0.010
	(0.018)	(0.001)	(0.013)	(0.005)
55-64 years old	0.005	-0.000	-0.003	-0.001
	(0.016)	(0.000)	(0.012)	(0.004)
≥65 years old	*Ref*	*Ref*	*Ref*	*Ref*
Dwelling Tenure				
Own	*Ref*	*Ref*	*Ref*	*Ref*
Rent	0.061***	-0.002	-0.044***	-0.015***
	(0.014)	(0.001)	(0.010)	(0.003)
Other	0.149***	-0.018	-0.101***	-0.030***
	(0.042)	(0.011)	(0.025)	(0.006)
Third level education	0.032**	-0.000	-0.024**	-0.008*
	(0.013)	(0.001)	(0.009)	(0.003)
National Energy Policy Preferences				
Tradeoff Econ vs. Env				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*

Continued on next page

Table 4 (solar power technology) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Equally important	-0.045**	0.000	0.034**	0.010**
	(0.016)	(0.001)	(0.013)	(0.004)
Generally more important	-0.040*	-0.003	0.010	0.034***
	(0.020)	(0.018)	(0.018)	(0.010)
Tradeoff Econ vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.004	0.000	0.003	0.001
	(0.015)	(0.000)	(0.011)	(0.004)
Generally more important	-0.025	-0.000	0.019	0.007
	(0.019)	(0.001)	(0.014)	(0.005)
Tradeoff Econ vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.034	0.000	-0.023	-0.011
	(0.020)	(0.001)	(0.014)	(0.007)
Generally more important	0.007	0.038**	-0.012	-0.034***
	(0.019)	(0.015)	(0.017)	(0.010)
Tradeoff Env vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.007	-0.000	0.005	0.002
	(0.016)	(0.001)	(0.012)	(0.005)
Generally more important	0.047**	-0.001	-0.034**	-0.011**
	(0.018)	(0.001)	(0.013)	(0.004)
Tradeoff Env vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.001	0.000	-0.001	-0.000
	(0.021)	(0.002)	(0.017)	(0.006)
Generally more important	0.056**	0.001	-0.042**	-0.015*
	(0.020)	(0.002)	(0.015)	(0.006)
Tradeoff Rel vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.023	-0.001	0.018	0.007
	(0.024)	(0.001)	(0.018)	(0.007)
Generally more important	0.015	-0.000	-0.011	-0.004
	(0.022)	(0.000)	(0.016)	(0.006)
Technology Specific Perceptions and Preferences				
Landscape				
Don't know	-0.031	-0.003	0.025	0.009
	(0.034)	(0.005)	(0.028)	(0.011)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*

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Table 4 (solar power technology) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Neutral	0.072***	-0.049**	-0.011	-0.013
	(0.019)	(0.018)	(0.018)	(0.008)
Generally positive	0.054**	-0.052**	-0.015	0.013
	(0.019)	(0.018)	(0.018)	(0.011)
Health				
Don't know	-0.008	-0.002	0.007	0.003
	(0.040)	(0.011)	(0.034)	(0.017)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.041	0.008	-0.034	-0.015
	(0.028)	(0.007)	(0.023)	(0.011)
Generally positive	0.115***	0.011	-0.092***	-0.034**
	(0.027)	(0.007)	(0.023)	(0.011)
Economy				
Don't know	0.057	0.012	-0.037	-0.031
	(0.042)	(0.009)	(0.028)	(0.023)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.089**	0.015	-0.058**	-0.045*
	(0.030)	(0.007)	(0.020)	(0.018)
Generally positive	0.105***	0.045*	-0.054*	-0.097***
	(0.029)	(0.018)	(0.024)	(0.020)
Local employment				
Don't know	0.033	-0.001	-0.024	-0.008
	(0.041)	(0.002)	(0.030)	(0.010)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	-0.031	-0.001	0.024	0.009
	(0.032)	(0.001)	(0.024)	(0.009)
Generally positive	0.011	-0.000	-0.008	-0.003
	(0.031)	(0.000)	(0.023)	(0.008)

Based on a sample of 3,951 respondents
Likelihood Ratio χ^2 1134.49
***p<0.01, **p<0.05, *p<0.1

Table 5: Drivers of the stated preferences for the minimum distance of **biomass power plant** from place of residence

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Socio-demographic Characteristics				
Country of Residence				
US	*Ref*	*Ref*	*Ref*	*Ref*
Ireland	0.024***	0.071***	-0.004	-0.091***
	(0.006)	(0.015)	(0.004)	(0.018)
Germany	0.197***	0.155***	-0.269***	-0.083***
	(0.018)	(0.021)	(0.021)	(0.021)
Age of Respondent				
15-34 years old	-0.034***	-0.047***	0.009**	0.071***
	(0.008)	(0.011)	(0.003)	(0.017)
35-44 years old	-0.027**	-0.036**	0.009**	0.054**
	(0.009)	(0.012)	(0.003)	(0.018)
45-54 years old	-0.030***	-0.041***	0.010**	0.062***
	(0.008)	(0.011)	(0.003)	(0.017)
55-64 years old	-0.023**	-0.030**	0.009**	0.044**
	(0.008)	(0.010)	(0.003)	(0.015)
$\geq$65 years old	*Ref*	*Ref*	*Ref*	*Ref*
Dwelling Tenure				
Own	*Ref*	*Ref*	*Ref*	*Ref*
Rent	0.011*	0.016	-0.003	-0.025*
	(0.006)	(0.008)	(0.002)	(0.012)
Other	0.052*	0.064**	-0.027	-0.089**
	(0.024)	(0.023)	(0.018)	(0.029)
Third level education	0.003	0.005	-0.001	-0.007
	(0.006)	(0.008)	(0.001)	(0.012)
National Energy Policy Preferences				
Tradeoff Econ vs. Env				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.021**	-0.034**	0.005*	0.050**
	(0.006)	(0.011)	(0.002)	(0.016)
Generally more important	0.015	-0.012	-0.057**	0.054**
	(0.013)	(0.019)	(0.021)	(0.020)
Tradeoff Econ vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.005	0.007	-0.001	-0.011
	(0.007)	(0.010)	(0.002)	(0.015)
Generally more important	0.011	0.016	-0.003	-0.024
	(0.009)	(0.012)	(0.003)	(0.018)

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Table 5 (biomass power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Tradeoff Econ vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.016	0.023	-0.004	-0.035
	(0.009)	(0.012)	(0.003)	(0.018)
Generally more important	0.003	0.005	-0.000	-0.008
	(0.007)	(0.011)	(0.001)	(0.017)
Tradeoff Env vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.004	0.006	-0.001	-0.008
	(0.007)	(0.010)	(0.002)	(0.016)
Generally more important	0.006	0.008	-0.001	-0.012
	(0.007)	(0.010)	(0.002)	(0.016)
Tradeoff Env vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.014	-0.021	0.003	0.032
	(0.009)	(0.014)	(0.003)	(0.021)
Generally more important	-0.005	-0.007	0.002	0.010
	(0.009)	(0.012)	(0.003)	(0.018)
Tradeoff Rel vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.008	-0.012	0.000	0.019
	(0.010)	(0.016)	(0.001)	(0.025)
Generally more important	0.002	-0.010	0.053**	-0.045
	(0.013)	(0.020)	(0.020)	(0.024)
Technology Specific Perceptions and Preferences				
Landscape				
Don't know	0.001	0.001	0.000	-0.003
	(0.014)	(0.020)	(0.003)	(0.037)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	-0.000	0.097***	-0.020	-0.076***
	(0.011)	(0.019)	(0.022)	(0.021)
Generally positive	0.039***	0.049***	-0.008	-0.079***
	(0.011)	(0.013)	(0.005)	(0.021)
Odour				
Don't know	-0.006	-0.012	0.001	0.016
	(0.011)	(0.022)	(0.002)	(0.031)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.050***	-0.025	-0.005	-0.020
	(0.015)	(0.020)	(0.025)	(0.024)

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Table 5 (biomass power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Generally positive	0.027	-0.014	-0.048	0.034
	(0.016)	(0.024)	(0.027)	(0.032)
Air				
Don't know	0.012	-0.015	0.060*	-0.058
	(0.023)	(0.031)	(0.026)	(0.037)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.013	0.019	-0.003	-0.028
	(0.009)	(0.013)	(0.002)	(0.020)
Generally positive	0.007	0.010	-0.001	-0.016
	(0.011)	(0.017)	(0.002)	(0.026)
Water				
Don't know	0.009	0.013	-0.002	-0.019
	(0.015)	(0.021)	(0.004)	(0.032)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.002	0.003	-0.000	-0.005
	(0.008)	(0.012)	(0.001)	(0.019)
Generally positive	0.012	0.018	-0.003	-0.027
	(0.012)	(0.017)	(0.004)	(0.026)
Health				
Don't know	0.001	0.002	0.001	-0.004
	(0.012)	(0.022)	(0.008)	(0.043)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.027*	0.074***	0.053*	-0.154***
	(0.012)	(0.019)	(0.022)	(0.024)
Generally positive	0.052***	0.077***	-0.006	-0.123***
	(0.012)	(0.017)	(0.008)	(0.026)
Economy				
Don't know	0.014	0.021	0.006	-0.041
	(0.018)	(0.025)	(0.008)	(0.050)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.011	0.016	0.005	-0.033
	(0.011)	(0.017)	(0.007)	(0.034)
Generally positive	0.019	0.094***	0.030	-0.143***
	(0.014)	(0.022)	(0.020)	(0.034)
Local employment				
Don't know	0.013	0.018	-0.003	-0.028
	(0.022)	(0.030)	(0.006)	(0.045)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	-0.005	-0.008	0.000	0.013
	(0.013)	(0.020)	(0.002)	(0.032)
Generally positive	0.005	0.008	-0.001	-0.012

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Table 5 (biomass power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
	(0.013)	(0.020)	(0.002)	(0.031)

Based on a sample of 3,039 respondents
Likelihood Ratio χ^2 912.98
***p<0.01, **p<0.05, *p<0.1

Table 6: Drivers of the stated preferences for the minimum distance of **coal-fired power plant** from place of residence

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Socio-demographic Characteristics				
Country of Residence				
US	*Ref*	*Ref*	*Ref*	*Ref*
Ireland	0.022*	0.056***	0.008	-0.085***
	(0.008)	(0.014)	(0.021)	(0.023)
Germany	0.046***	0.070***	-0.082***	-0.033
	(0.009)	(0.013)	(0.019)	(0.022)
Age of Respondent				
15-34 years old	0.005	0.013	0.022	-0.040
	(0.003)	(0.007)	(0.012)	(0.021)
35-44 years old	-0.002	-0.006	-0.012	0.020
	(0.003)	(0.007)	(0.013)	(0.023)
45-54 years old	0.001	0.002	0.003	-0.005
	(0.003)	(0.007)	(0.012)	(0.021)
55-64 years old	0.002	0.004	0.008	-0.013
	(0.002)	(0.006)	(0.011)	(0.020)
≥65 years old	*Ref*	*Ref*	*Ref*	*Ref*
Dwelling Tenure				
Own	*Ref*	*Ref*	*Ref*	*Ref*
Rent	0.003	0.007	0.012	-0.021
	(0.002)	(0.005)	(0.009)	(0.016)
Other	-0.004	-0.010	-0.019	0.033
	(0.005)	(0.014)	(0.028)	(0.046)
Third level education	-0.001	-0.001	-0.002	0.004
	(0.002)	(0.005)	(0.008)	(0.015)

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Table 6 (coal-fired power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
National Energy Policy Preferences				
Tradeoff Econ vs. Env				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.000	-0.001	-0.002	0.004
	(0.002)	(0.005)	(0.012)	(0.020)
Generally more important	0.013	0.056***	0.004	-0.073**
	(0.007)	(0.013)	(0.020)	(0.022)
Tradeoff Econ vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.002	0.005	0.008	-0.015
	(0.002)	(0.006)	(0.010)	(0.019)
Generally more important	0.006	0.015	0.025*	-0.045*
	(0.003)	(0.008)	(0.012)	(0.023)
Tradeoff Econ vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.007*	0.018*	0.033*	-0.058*
	(0.003)	(0.007)	(0.013)	(0.023)
Generally more important	0.005*	0.014*	0.026*	-0.045*
	(0.002)	(0.006)	(0.012)	(0.021)
Tradeoff Env vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.006**	-0.016**	-0.031*	0.052**
	(0.002)	(0.006)	(0.012)	(0.020)
Generally more important	0.002	0.005	-0.084***	0.077***
	(0.006)	(0.011)	(0.018)	(0.021)
Tradeoff Env vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.005	-0.011	-0.017	0.033
	(0.004)	(0.009)	(0.014)	(0.026)
Generally more important	-0.010**	-0.025**	-0.042**	0.076**
	(0.003)	(0.008)	(0.013)	(0.024)
Tradeoff Rel vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.007*	-0.020*	-0.041*	0.068*
	(0.003)	(0.009)	(0.017)	(0.029)
Generally more important	0.002	0.006	0.010	-0.018
	(0.003)	(0.008)	(0.014)	(0.025)

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Table 6 (coal-fired power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Technology Specific Perceptions and Preferences				
Landscape				
Don't know	0.008	0.021	0.040	-0.070
	(0.005)	(0.014)	(0.024)	(0.043)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.013***	0.036***	0.062***	-0.111***
	(0.003)	(0.008)	(0.012)	(0.022)
Generally positive	0.013**	0.035**	0.061***	-0.110**
	(0.005)	(0.012)	(0.018)	(0.034)
Air				
Don't know	0.029**	0.070**	0.092***	-0.191***
	(0.011)	(0.022)	(0.016)	(0.048)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.013**	0.034**	0.056***	-0.103***
	(0.004)	(0.011)	(0.015)	(0.030)
Generally positive	0.016	0.048*	-0.037	-0.028
	(0.010)	(0.020)	(0.030)	(0.043)
Water				
Don't know	-0.007	-0.042***	0.074*	-0.025
	(0.007)	(0.012)	(0.029)	(0.033)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.011***	0.030***	0.048***	-0.088***
	(0.003)	(0.007)	(0.011)	(0.021)
Generally positive	0.011*	0.029*	0.047*	-0.087*
	(0.005)	(0.014)	(0.020)	(0.039)
Health				
Don't know	0.002	0.005	0.011	-0.018
	(0.005)	(0.014)	(0.029)	(0.049)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.027***	0.067***	0.095***	-0.189***
	(0.005)	(0.011)	(0.012)	(0.026)
Generally positive	0.006	0.016	0.032	-0.053
	(0.005)	(0.013)	(0.025)	(0.043)
Economy				
Don't know	-0.005	-0.014	-0.028	0.047
	(0.004)	(0.013)	(0.026)	(0.043)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.003	0.007	0.014	-0.024
	(0.003)	(0.008)	(0.015)	(0.026)
Generally positive	0.008	0.006	0.110***	-0.125***
	(0.007)	(0.013)	(0.021)	(0.026)

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Table 6 (coal-fired power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Local employment				
Don't know	-0.012	-0.015	-0.034	0.062
	(0.009)	(0.011)	(0.026)	(0.046)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	-0.029*	-0.013	0.031	0.011
	(0.013)	(0.015)	(0.025)	(0.030)
Generally positive	-0.026	0.024	0.067**	-0.065*
	(0.013)	(0.017)	(0.025)	(0.029)

Based on a sample of 3,876 respondents
Likelihood Ratio χ^2 982.28
***p<0.01, **p<0.05, *p<0.1

Table 7: Drivers of the stated preferences for the minimum distance of **natural gas power plant** from place of residence

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Socio-demographic Characteristics				
Country of Residence				
US	*Ref*	*Ref*	*Ref*	*Ref*
Ireland	-0.009	0.091***	-0.016	-0.067***
	(0.009)	(0.020)	(0.022)	(0.018)
Germany	0.147***	0.183***	-0.234***	-0.096***
	(0.017)	(0.020)	(0.021)	(0.018)
Age of Respondent				
15-34 years old	-0.027***	-0.045***	0.012***	0.060***
	(0.006)	(0.011)	(0.003)	(0.015)
35-44 years old	-0.035***	-0.062***	0.011**	0.086***
	(0.006)	(0.012)	(0.004)	(0.017)
45-54 years old	-0.032***	-0.055***	0.011***	0.075***
	(0.006)	(0.011)	(0.003)	(0.015)
55-64 years old	-0.011	-0.017	0.007	0.021
	(0.006)	(0.010)	(0.004)	(0.012)
≥65 years old	*Ref*	*Ref*	*Ref*	*Ref*
Dwelling Tenure				
Own	*Ref*	*Ref*	*Ref*	*Ref*
Rent	0.031**	-0.014	0.016	-0.033*
	(0.010)	(0.014)	(0.017)	(0.014)

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Table 7 (natural gas power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
Other	0.106**	0.062	-0.152**	-0.015
	(0.041)	(0.049)	(0.049)	(0.039)
Third level education	-0.008	0.041**	0.004	-0.037**
	(0.009)	(0.014)	(0.017)	(0.014)
National Energy Policy Preferences				
Tradeoff Econ vs. Env				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.000	-0.001	0.000	0.001
	(0.005)	(0.010)	(0.001)	(0.014)
Generally more important	0.014*	0.024*	-0.006	-0.032*
	(0.006)	(0.011)	(0.003)	(0.014)
Tradeoff Econ vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.002	0.004	-0.001	-0.005
	(0.005)	(0.009)	(0.002)	(0.013)
Generally more important	0.006	0.011	-0.002	-0.014
	(0.007)	(0.012)	(0.003)	(0.016)
Tradeoff Econ vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	0.006	0.011	-0.002	-0.016
	(0.007)	(0.012)	(0.002)	(0.017)
Generally more important	0.008	0.015	-0.002	-0.020
	(0.006)	(0.011)	(0.002)	(0.015)
Tradeoff Env vs. Rel				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.011	-0.019	0.003	0.027
	(0.006)	(0.010)	(0.002)	(0.014)
Generally more important	-0.004	-0.008	0.002	0.010
	(0.006)	(0.010)	(0.002)	(0.014)
Tradeoff Env vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.039*	0.013	0.033	-0.007
	(0.016)	(0.021)	(0.026)	(0.024)
Generally more important	-0.041**	0.027	0.029	-0.016
	(0.013)	(0.018)	(0.022)	(0.022)
Tradeoff Rel vs. Soc				
Generally less important	*Ref*	*Ref*	*Ref*	*Ref*
Equally important	-0.014	-0.028	0.001	0.041

Continued on next page

Table 7 (natural gas power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
	(0.008)	(0.015)	(0.002)	(0.022)
Generally more important	0.005	0.008	-0.002	-0.011
	(0.007)	(0.013)	(0.003)	(0.018)
Technology Specific Perceptions and Preferences				
Landscape				
Don't know	0.000	0.001	0.000	-0.001
	(0.010)	(0.020)	(0.001)	(0.031)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.024***	0.042***	-0.008**	-0.058***
	(0.006)	(0.010)	(0.003)	(0.014)
Generally positive	0.015*	0.028*	-0.003	-0.040*
	(0.007)	(0.013)	(0.003)	(0.019)
Air				
Don't know	0.005	0.011	0.001	-0.017
	(0.011)	(0.022)	(0.002)	(0.035)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.015	0.033*	0.046*	-0.094***
	(0.009)	(0.015)	(0.018)	(0.019)
Generally positive	0.032***	0.057***	-0.008	-0.082***
	(0.008)	(0.015)	(0.004)	(0.020)
Water				
Don't know	0.010	0.019	-0.001	-0.029
	(0.010)	(0.019)	(0.002)	(0.028)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.014*	0.026*	-0.002	-0.038*
	(0.006)	(0.011)	(0.002)	(0.016)
Generally positive	0.025**	0.046**	-0.008	-0.063**
	(0.009)	(0.016)	(0.004)	(0.021)
Health				
Don't know	0.003	0.007	0.001	-0.011
	(0.010)	(0.021)	(0.002)	(0.033)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.025***	0.047***	-0.004	-0.068***
	(0.006)	(0.011)	(0.003)	(0.016)
Generally positive	0.028**	0.052***	-0.006	-0.073***
	(0.008)	(0.015)	(0.004)	(0.022)
Economy				
Don't know	-0.081**	-0.046	0.153***	-0.026
	(0.031)	(0.037)	(0.040)	(0.044)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	-0.082**	-0.003	0.077*	0.008

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Table 7 (natural gas power plant) – continued from previous page

Explanatory variables	0-1km/miles	1-5km/miles	>5km/miles	Oppose
	(0.027)	(0.031)	(0.034)	(0.032)
Generally positive	-0.071**	0.027	0.128***	-0.084**
	(0.026)	(0.029)	(0.031)	(0.031)
Local employment				
Don't know	0.008	0.014	-0.001	-0.021
	(0.015)	(0.027)	(0.003)	(0.041)
Generally negative	*Ref*	*Ref*	*Ref*	*Ref*
Neutral	0.000	0.001	0.000	-0.001
	(0.010)	(0.019)	(0.001)	(0.030)
Generally positive	0.016	0.030	-0.004*	-0.042
	(0.010)	(0.019)	(0.002)	(0.029)

Based on a sample of 3,770 respondents
Likelihood Ratio χ^2 985.43
***p<0.01, **p<0.05, *p<0.1

Table 8: Drivers of the stated preferences for the minimum distance of **wind turbines** from place of residence

Explanatory variables	Model (1)	Model (2)	Model (3)
Socio-demographic Characteristics			
Country of Residence			
US	*Ref*	*Ref*	*Ref*
Ireland			
0-1km/miles	-0.046***	-0.027*	-0.014
	(0.010)	(0.012)	(0.012)
1-5km/miles	-0.041***	-0.022*	-0.012
	(0.009)	(0.010)	(0.010)
>5km/miles	0.048***	0.029*	0.016
	(0.010)	(0.013)	(0.013)
Oppose	0.038***	0.020*	0.010
	(0.009)	(0.009)	(0.008)
Germany			
0-1km/miles	0.122***	0.102***	0.189***
	(0.019)	(0.019)	(0.021)
1-5km/miles	0.070***	0.063**	0.047*
	(0.020)	(0.020)	(0.020)

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Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
>5km/miles	-0.190***	-0.190***	-0.236***
	(0.019)	(0.020)	(0.019)
Oppose	-0.002	0.026	0.000
	(0.013)	(0.015)	(0.013)
Age of Respondent			
15-34 years old			
0-1km/miles	0.043**	0.021	0.004
	(0.014)	(0.014)	(0.013)
1-5km/miles	0.022**	0.011	0.002
	(0.007)	(0.007)	(0.007)
>5km/miles	-0.038**	-0.019	-0.003
	(0.013)	(0.012)	(0.012)
Oppose	-0.027**	-0.013	-0.002
	(0.009)	(0.009)	(0.008)
35-44 years old			
0-1km/miles	-0.004	-0.019	-0.034
	(0.018)	(0.018)	(0.017)
1-5km/miles	-0.001	-0.007	-0.011
	(0.021)	(0.021)	(0.020)
>5km/miles	0.040	0.053*	0.063**
	(0.023)	(0.023)	(0.023)
Oppose	-0.035*	-0.026	-0.019
	(0.014)	(0.014)	(0.014)
45-54 years old			
0-1km/miles	-0.006	-0.015	-0.019
	(0.013)	(0.013)	(0.013)
1-5km/miles	-0.004	-0.010	-0.011
	(0.009)	(0.008)	(0.007)
>5km/miles	0.005	0.014	0.017
	(0.012)	(0.012)	(0.012)
Oppose	0.005	0.011	0.012
	(0.010)	(0.010)	(0.009)
55-64 years old			
0-1km/miles	0.017	0.017	0.023
	(0.012)	(0.013)	(0.013)

Continued on next page

Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
1-5km/miles	0.010	0.009	0.010
	(0.007)	(0.007)	(0.006)
>5km/miles	-0.015	-0.015	-0.020
	(0.011)	(0.011)	(0.011)
Oppose	-0.012	-0.011	-0.013
	(0.009)	(0.008)	(0.007)
>65 years old	*Ref*	*Ref*	*Ref*
Dwelling Tenure			
Own	*Ref*	*Ref*	*Ref*
Rent			
0-1km/miles	0.069***	0.065***	0.058***
	(0.014)	(0.014)	(0.014)
1-5km/miles	-0.012	-0.011	-0.016
	(0.016)	(0.016)	(0.016)
>5km/miles	-0.013	-0.015	-0.012
	(0.017)	(0.017)	(0.017)
Oppose	-0.044***	-0.040***	-0.031**
	(0.011)	(0.011)	(0.010)
Other			
0-1km/miles	0.136***	0.130***	0.106**
	(0.040)	(0.039)	(0.036)
1-5km/miles	0.050***	0.047***	0.040***
	(0.006)	(0.006)	(0.007)
>5km/miles	-0.119***	-0.114***	-0.095**
	(0.032)	(0.031)	(0.030)
Oppose	-0.067***	-0.063***	-0.051***
	(0.013)	(0.013)	(0.013)
Third level education			
0-1km/miles	-0.002	-0.022	-0.007
	(0.010)	(0.013)	(0.009)
1-5km/miles	-0.001	0.018	-0.004
	(0.006)	(0.015)	(0.005)
>5km/miles	0.002	0.021	0.006
	(0.009)	(0.016)	(0.009)
Oppose	0.001	-0.016	0.004

Continued on next page

Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
	(0.006)	(0.010)	(0.006)
National Energy Policy Preferences			
Tradeoff Econ vs. Env			
Generally less important		*Ref*	*Ref*
Equally important			
0-1km/miles		-0.045***	-0.038**
		(0.012)	(0.012)
1-5km/miles		-0.025***	-0.020**
		(0.007)	(0.007)
>5km/miles		0.044***	0.036**
		(0.012)	(0.012)
Oppose		0.026***	0.022**
		(0.008)	(0.007)
Generally more important			
0-1km/miles		-0.052**	-0.047***
		(0.016)	(0.012)
1-5km/miles		-0.029	-0.026***
		(0.018)	(0.007)
>5km/miles		0.006	0.045***
		(0.019)	(0.012)
Oppose		0.075***	0.028***
		(0.014)	(0.008)
Tradeoff Econ vs. Rel			
Generally less important		*Ref*	*Ref*
Equally important			
0-1km/miles		-0.012	-0.012
		(0.011)	(0.011)
1-5km/miles		-0.007	-0.007
		(0.007)	(0.006)
>5km/miles		0.011	0.012
		(0.011)	(0.011)
Oppose		0.008	0.007
		(0.008)	(0.007)
Generally more important			
0-1km/miles		0.016	0.002
		(0.019)	(0.018)

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Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
1-5km/miles		-0.021	-0.013
		(0.021)	(0.020)
>5km/miles		-0.028	-0.035
		(0.023)	(0.022)
Oppose		0.033*	0.045**
		(0.017)	(0.016)
Tradeoff Econ vs. Soc			
Generally less important		*Ref*	*Ref*
Equally important			
0-1km/miles		0.015	0.023
		(0.015)	(0.014)
1-5km/miles		0.009	0.014
		(0.009)	(0.008)
>5km/miles		-0.014	-0.022
		(0.013)	(0.013)
Oppose		-0.011	-0.015
		(0.010)	(0.009)
Generally more important			
0-1km/miles		0.023	0.032*
		(0.013)	(0.013)
1-5km/miles		0.013	0.018*
		(0.008)	(0.008)
>5km/miles		-0.021	-0.030*
		(0.012)	(0.012)
Oppose		-0.015	-0.020*
		(0.009)	(0.008)
Tradeoff Env vs. Rel			
Generally less important		*Ref*	*Ref*
Equally important			
0-1km/miles		0.036**	0.017
		(0.012)	(0.012)
1-5km/miles		0.023**	0.010
		(0.008)	(0.007)
>5km/miles		-0.034**	-0.016
		(0.011)	(0.011)

Continued on next page

Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
Oppose		-0.025**	-0.011
		(0.008)	(0.007)
Generally more important			
0-1km/miles		0.055***	0.037**
		(0.013)	(0.013)
1-5km/miles		0.032***	0.020**
		(0.007)	(0.007)
>5km/miles		-0.051***	-0.035**
		(0.012)	(0.012)
Oppose		-0.036***	-0.022**
		(0.008)	(0.007)
Tradeoff Env vs. Soc			
Generally less important		*Ref*	*Ref*
Equally important			
0-1km/miles		-0.002	-0.000
		(0.017)	(0.016)
1-5km/miles		-0.001	-0.000
		(0.010)	(0.009)
>5km/miles		0.002	0.000
		(0.012)	(0.014)
Oppose		0.002	0.000
		(0.015)	(0.012)
Generally more important			
0-1km/miles		0.006	-0.001
		(0.018)	(0.017)
1-5km/miles		0.049**	0.035*
		(0.017)	(0.017)
>5km/miles		0.019	0.009
		(0.019)	(0.019)
Oppose		-0.074***	-0.043***
		(0.015)	(0.013)
Tradeoff Rel vs. Soc			
Generally less important		*Ref*	*Ref*
Equally important			
0-1km/miles		-0.024	-0.021

Continued on next page

Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
		(0.018)	(0.018)
1-5km/miles		-0.015	-0.012
		(0.011)	(0.010)
>5km/miles		0.022	0.020
		(0.017)	(0.017)
Oppose		0.017	0.013
		(0.013)	(0.011)
Generally more important			
0-1km/miles		0.002	0.002
		(0.017)	(0.016)
1-5km/miles		0.001	0.001
		(0.009)	(0.008)
>5km/miles		-0.002	-0.002
		(0.015)	(0.015)
Oppose		-0.001	-0.001
		(0.010)	(0.009)
Technology Specific Perceptions			
Landscape			
Don't know			
0-1km/miles			0.032
			(0.022)
1-5km/miles			0.021
			(0.012)
>5km/miles			-0.033
			(0.022)
Oppose			-0.020
			(0.013)
Generally negative			*Ref*
Neutral			
0-1km/miles			0.061***
			(0.012)
1-5km/miles			0.034***
			(0.006)
>5km/miles			-0.060***
			(0.012)

Continued on next page

Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
Oppose			-0.035***
			(0.006)
Generally positive			
0-1km/miles			0.071***
			(0.016)
1-5km/miles			-0.028
			(0.017)
>5km/miles			-0.042*
			(0.020)
Oppose			-0.001
			(0.014)
Sound			
Don't know			
0-1km/miles			0.075***
			(0.022)
1-5km/miles			0.041***
			(0.009)
>5km/miles			-0.071***
			(0.020)
Oppose			-0.045***
			(0.011)
Generally negative			*Ref*
Neutral			
0-1km/miles			0.056***
			(0.011)
1-5km/miles			0.034***
			(0.007)
>5km/miles			-0.054***
			(0.011)
Oppose			-0.036***
			(0.007)
Generally positive			
0-1km/miles			0.061***
			(0.014)
1-5km/miles			0.036***
			(0.008)

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Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
>5km/miles			-0.059***
			(0.013)
Oppose			-0.039***
			(0.008)
Health			
Don't know			
0-1km/miles			0.025
			(0.017)
1-5km/miles			0.028
			(0.018)
>5km/miles			-0.024
			(0.016)
Oppose			-0.030
			(0.019)
Generally negative			*Ref*
Neutral			
0-1km/miles			0.076***
			(0.011)
1-5km/miles			0.066***
			(0.012)
>5km/miles			-0.073***
			(0.011)
Oppose			-0.069***
			(0.013)
Generally positive			
0-1km/miles			0.125***
			(0.016)
1-5km/miles			0.056**
			(0.019)
>5km/miles			-0.076***
			(0.020)
Oppose			-0.105***
			(0.016)
Economy			
Don't know			

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Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
0-1km/miles			-0.012
			(0.036)
1-5km/miles			0.011
			(0.036)
>5km/miles			0.090*
			(0.037)
Oppose			-0.089**
			(0.031)
Generally negative			*Ref*
Neutral			
0-1km/miles			-0.037
			(0.030)
1-5km/miles			0.065*
			(0.032)
>5km/miles			0.077*
			(0.031)
Oppose			-0.105***
			(0.025)
Generally positive			
0-1km/miles			0.007
			(0.027)
1-5km/miles			0.105***
			(0.028)
>5km/miles			0.060*
			(0.028)
Oppose			-0.172***
			(0.024)
Local employment			
Don't know			
0-1km/miles			0.037
			(0.022)
1-5km/miles			0.024
			(0.015)
>5km/miles			-0.035
			(0.021)

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Table 8 (wind turbines) – continued from previous page

Explanatory variables	Model (1)	Model (2)	Model (3)
Oppose			-0.026
			(0.016)
Generally negative			*Ref*
Neutral			
0-1km/miles			0.030
			(0.017)
1-5km/miles			0.020
			(0.012)
>5km/miles			-0.029
			(0.016)
Oppose			-0.021
			(0.013)
Generally positive			
0-1km/miles			0.045**
			(0.016)
1-5km/miles			0.028*
			(0.012)
>5km/miles			-0.043**
			(0.016)
Oppose			-0.030*
			(0.013)
Likelihood Ratio	283.72	461.98	998.00
N	3989	3989	3989

Year	Number	Title/Author(s)
2017		
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