The effect of cooperative ownership on social acceptance of onshore wind power: a multi-method analysis

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Abstract:

Wind power development has provoked considerable opposition in many places all over the world. To tackle this issue, a growing number of scholars have emphasized the need for more deliberative and inclusive participation of consumers in the energy production process. Focusing on the case of Flanders, this article investigates a specific way of involving citizens in the diffusion of wind power projects, namely renewable energy cooperatives, seeking to answer the following question: do renewable energy cooperatives enhance attitudes toward onshore wind turbines, and how? I use a multi-methods research design which combines quasi-experimental evidence with in-depth case studies. The results show that cooperatives have a strong positive effect on attitudes toward wind turbines, confirming the importance of participatory schemes. I also highlight the causal mechanisms through which cooperatives influence their members' attitudes.

Keywords: wind energy, cooperative, social acceptability, NIMBY.

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1. Introduction

Onshore wind turbines have been the renewable energy technology most subject to contention to date. Indeed, wind power development has provoked considerable opposition in many places all over the world. The motivations often invoked are the impacts on natural landscapes and their subsequent negative effects on tourism, the generation of noise pollution or flicker shadow and the negative consequences for property prices and local fauna and flora. Such resistance can even take the form of formalized citizen networks such as Vent de Colère (France), Vent de Raison (Belgium), Opzione 0 (Italy), Iaeden (Spain), Stilhed (Denmark), etc. In Belgium, despite a widespread public support for wind power (IPSOS-Belgium 2010), the presence of organized groups and local residents opposed to wind farm projects also reveal the limits of such a social adhesion.

Local opposition to wind energy projects is commonly explained in terms of NIMBYism (from "Not In My Back Yard"). This term refers to the position of people that view wind energy as positive for society in general, but who are motivated by their personal cost-benefits analysis to resist the construction of a wind farm in their direct neighborhood. However, the concept of NIMBY has been criticized by various scholars who argue that it is too simplistic and unable to apprehend the real motives of the majority of opponents (Wolsink 2006, Burningham et al. 2006, Devine-Wright 2005).

Seeking to go beyond the NIMBY explanation, various studies show that social acceptance of the impact of windmills heavily depends on different psycho-social factors, such as place attachment (Devine-Wright 2009), distributive and procedural justice (Gross 2007, Hall et al. 2013) or trust (Walker et al. 2010). Other scholars have emphasized institutional factors, such as the ownership structure, the planning procedures and the degree of citizen involvement, stressing the need for more deliberative and inclusive participation of consumers in the energy production process (Devine-Wright and Devine-Wright 2004, Breukers and Wolsink 2007, Schweizer-Ries 2008, Warren and McFadyen 2010).

This article investigates a specific way of involving citizens in the diffusion of wind power projects, namely renewable energy cooperatives. These are organizations that enable consumers themselves to own and invest in renewable energy generation units. More specifically, it seeks to answer the following question: do renewable energy cooperatives enhance attitudes toward onshore wind turbines, and how? What follows specifically concerns the case of Flanders, Northern Belgium.

It has often been argued that local ownership induces more positive attitudes to wind energy (Devine-Wright 2007, Krohn and Damborg 1999). To the best of our knowledge, however, only one study has investigated this issue quantitatively in the past. In a comparison of two windfarms in Scotland with different ownership schemes, Warren and McFadyen (2010) show that community-owned windfarms are associated with more positive local attitudes than are windfarms owned by commercial companies. Yet this study uses descriptive data and, therefore, does not control for important confounding factors. In addition, it does not deal with the problem of self-selection bias: individuals presenting positive attitudes toward wind power are more likely to join cooperatives. Finally, this study does not investigate the mechanisms underlying this positive relationship between local ownership and positive attitudes toward wind power.

The present research is thus innovative in three ways. First, it provides a quantitative analysis of this question which explicitly seeks to isolate the causal effect of local ownership on attitudes toward wind power. Secondly, it explores the causal pathway through which this causal relationship takes place. It does so by complementing this quantitative analysis with a qualitative study of systematically selected cases. Thirdly, the article is also innovative from a methodological perspective, because the multi-method research design used goes further than the traditional "triangulation" framework (Jick 1979, Olsen 2004)–asking the same question of causal inference using two different methods, and checking that the same substantive conclusions are produced by both–and rather embraces a so-called "integrative" multi-method approach, in which two or more methods are carefully combined to support a single, unified causal inference.

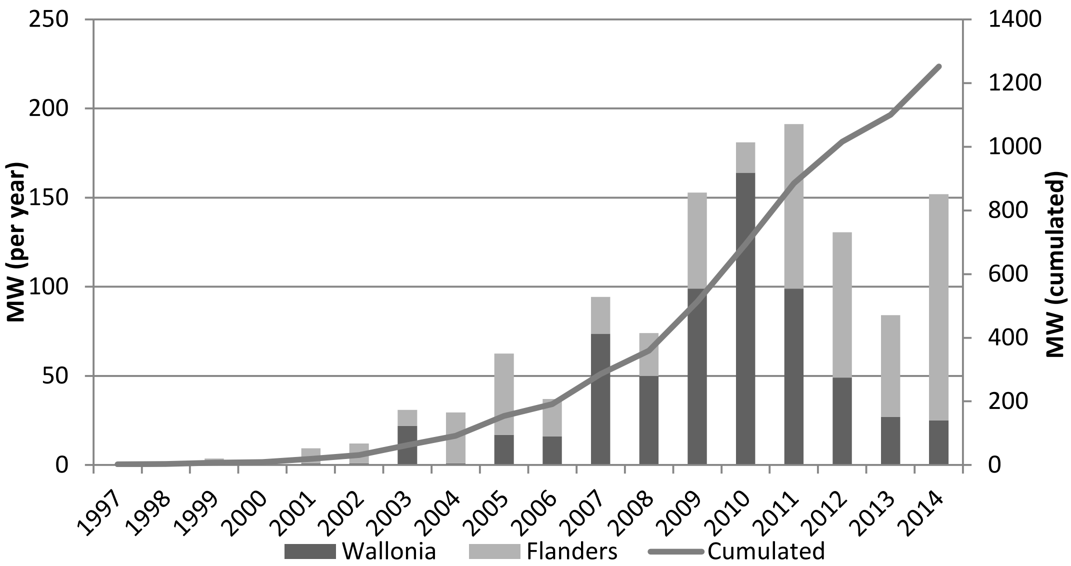
The rest of the paper is structured as follows. Section 2 outlines some descriptive information about the Flemish institutional context and how it affects citizen participation in wind power development. Section 3 and 4 describe respectively the conceptual framework and the methodology used in this study. Section 5 and 6 are devoted to the presentation of the results: section 5 presents the quantitative results of the econometric analysis while section 6 presents the results of the case studies. Section 7 presents the policy implications and the conclusions.

2. Context of the study

2.1. Onshore wind development in Belgium

In line with the European 20-20-20 energy targets, the objective of Belgium is to produce 13% of its final energy consumption from renewable energy (RE) in 2020. Alongside this national objective, each region has also its own target for RE development by 2020. In Flanders, the authorities aim at increasing the share of onshore wind power to 1,063 MW by 2020. As figure 1 shows, the evolution of wind power capacity in Belgium was rather spectacular between 2002 and 2011, rising from 31.4 to 885.1 MW. The first projects were mainly realized in Flanders, but Wallonia rapidly caught up and experienced a much faster expansion from 2006 onwards. Yet this growth has been severely weakened since 2011, as shown by figure 2. Much less new projects have been realized, mostly in the South of the country. This slowdown is mainly due to the increasing number of juridical appeals introduced against wind power projects. In december 2014, 37 projects, which represented 215 windmills and a capacity of 592 MW, were in procedure of appeal.

Figure 1. Onshore wind power installed capacity in Belgium, 1997-2013 (in MW).



Source: created by author based on data from APERE and ODE Vlaanderen.

2.2. An adverse context for cooperative initiatives

There are 5 RE cooperatives and 3 local citizen organizations in Flanders. Ecopower and BeauVent, the two largest Flemish cooperatives, represented, in 2013, 3.8% of total wind power capacity installed on the Flemish territory. In order to promote the renewable energy cooperative model in Belgium, a national federation, REScoop.be[2], has been created and gathers 23 organizations, 8 in Flanders and 15 in Wallonia. In 2014, this federation has been split into two regional sections, one for Flanders and one for Wallonia. This relatively small number of cooperative and participative initiatives may partly be explained by an unfavorable institutional context. Pepermans and Loots (2013) note that wind power has been developed following a top-down fashion, while bottom-up emergence is an exception. Moreover, according to the Social Economic Council of Flanders, the green certificate system implemented to encourage RE generation favors incumbent, large scale energy producers to the detriment of new and more participatory initiatives. Existing, large electricity producers

[2] http://www.rescoop.be/.

and suppliers have an advantage over new players because they can easily and quickly develop cheap RE production by burning biomass in existing coal plants. Getting a permit for a new biomass power plant or wind turbines is far more difficult (Vlaanderen 2011). Another obstacle for the latter is the "first-come, first-served" system prevailing in wind siting processes. That is, authorities address the permit requests in chronological order. This policy, combined with the absence of scarcity of suitable sites, the increasing number of wind developers and the zoning policies of the competent authorities, have created a highly competitive environment and encouraged a "wind rush" on the available locations (Pepermans and Loots 2013). In this context, cooperatives lack the time and resources to act as fast as large-scale wind power producers. This competitive environment also prevents developers from interacting with local residents and forces them to involve the latter after the project has been defined, because they risk losing their sites to the advantage of a competitor. Yet the acceptability of a wind project requires a relatively long process and should begin as early as possible.

2.3. The emergence of "top-down" cooperatives

An additional factor which influences the development of cooperatives in Belgium is the creation by different investor-owned power companies, including the Belgian incumbent company, of their own cooperative firms to increase citizen participation in wind power projects. There are six of these organizations, four in Flanders and two in Wallonia. However, a detailed examination of the statutes of these "top-down" initiatives clearly shows that they present substantial differences with "bottom-up" initiatives, i.e. cooperatives founded by citizens themselves. According to the statutes of these organizations, their business purpose consists in the acquisition of a cooperative capital to finance renewable energy production plants by granting loans to the companies actually owning and operating the assets, often wind turbines. Hence, cooperative members do not actually co-own wind turbines, which remain the property of these operating companies. The latter are generally the parent power companies or one of their subsidiaries. The cooperatives are thus primarily designed to raise funds from citizens, but do not provide any ownership right on generation assets. The emergence of these organizations is a challenge for "bottom-up" cooperatives and forces them to emphasize their specificities to acquire legitimacy.

3. Theoretical framework

3.1. The NIMBY concept and its limitations

Local opposition to wind energy projects is commonly explained in terms of the NIMBY phenomenon. From an economic perspective, the NIMBY effect represents a social dilemma, that is, a situation in which individual strategies clash with collective interest (Frey and Oberholzer-Gee 1997). Indeed, wind energy encompasses various global positive externalities (expansion of renewable energy capacity and reduction of greenhouse gas emissions linked to conventional energy generation, job creation in renewable energy industry, decrease in imported resources dependence, etc.). However, local residents taken individually do not have the incentives to cooperate by supporting projects, since the latter impose net costs. If this situation is generalized in all locations, it may lead to a collective-action problem and the underprovision of onshore wind power. Furthermore, if NIMBY responses are indeed motivated by self-interest, then providing monetary compensations to affected individuals would be an appropriate solution.

Consistently with the conventional theory of social dilemma (Olson 1965), the NIMBY explanation assumes that individuals are self-regarding–they only care about their own outcomes–and rational. However, substantial empirical evidence shows that individuals involved in social dilemma do not purely seek benefits for self. They may also care, for instance, about the manner in which others behave as well as the values, codes of behavior, mores and social norms at play (Ben-Ner and Putterman 1999). In particular, people are not only motivated by absolute payoffs, but also value allocations due to their distributional consequences (Fehr and Schmidt 1999). Inequity aversion is consistent with observations of behavior in standard economics experiments, such as the dictator game, the ultimatum game and the trust game. In addition, far from being purely rational, it is apparent that emotions play a potentially significant role in a number of respects. As far as the acceptance of wind farm projects is concerned, the literature highlights the importance of *place attachment*. The concept of place attachment goes beyond aesthetics considerations and is meant to highlight the symbolic value that people may attach to the local landscape (Devine-Wright 2009, Cass and Walker 2009). In line with these considerations, the concept of NIMBY has been largely criticized by various scholars who argue that it is too simplistic and unable to apprehend the real motives of the majority of opponents (Wolsink 2006, Burningham et al. 2006, Devine-Wright 2005).

3.2. Beyond NIMBY: the concept of social acceptance

Seeking to go beyond the NIMBY framework, scholars have developed the notion of "social acceptance". This concept refers to the fact that the development of renewable energy technologies depends on the willingness to accept the key aspects of the innovation that they imply among society and its different actors (consumers, producers, authorities, etc). Wüstenhagen et al. (2007) identify three dimensions of social acceptance as far as renewable energy innovations are concerned: socio-political, community and market. Socio-political acceptance concerns the broad societal consensus (or lack thereof) that renewables have positive consequences, what Ek (2005) has called public attitudes towards energy technologies. In turn, community and market acceptances relate to "decisions about the integration of renewable power generation at a particular location and in a community" (Wolsink 2012: 827). This article focuses on community acceptance, which is more directly concerned with private attitudes towards energy technologies and thus reflects individuals' personal well-being. Different factors may influence community acceptance. Three of them, which are particularly relevant for studying wind cooperative initiatives, are here explored in more detail: distributive justice, procedural justice and trust in the developer.

3.3. Justice and social acceptance

Feelings of fairness refer to perceptions of what psychologists call procedural and distributive justice (Schweizer-Ries 2008, Gross 2007). Distributive justice involves the subjective individual estimation of the way benefits and costs–which may not be merely material–are distributed within a group. Benefits can be monetary, like the earnings from the electricity produced or the creation of new jobs, as well as non-monetary, e.g. landscape-balancing actions in the region. Similarly, costs can be associated to change of the local landscape and noise pollution, real estate depreciation, etc. Procedural justice concerns the subjectively perceived fairness of the process through which wind turbines are implemented and relate to aspects such as zoning and licensing processes, the possibilities for participation, time and amount of information, etc.

Justice and perceptions of fairness are central to a community's social well-being. "Outcomes that are perceived to be unfair can result in protests, damaged relationships and divided communities, particularly when decisions are made which benefit some sections of the community at the perceived expense of others" (Gross 2007: 35). If local communities feel that external interests are monopolizing most of the benefits from the electricity produced or that they are not involved in the development process, they may feel unjustly treated and, in turn, take part in oppositional activism.

3.4. Trust and social acceptance

Trust in the developer is critical when it comes to social acceptance of RE technologies (Jobert et al. 2007, Walker et al. 2010). "When people know little about a technology, acceptance may mostly depend on trust in actors that are responsible for the technology, as a heuristic or alternative ground to base one's opinion on" (Huijts et al. 2012). Furthermore, trust enables shared cognition. That is to say, people can rely on statements of others without having to go back to premises to check their validity (Cvetkovich 1999). This is why trust also makes it possible to cope with a new situation more quickly. Generally speaking, "trusting social relationships support and enable cooperation, communication and commitment such that projects can be developed and technologies installed in ways which are locally appropriate, consensual rather than divisive, and with collective benefits to the fore." (Walker et al. 2010: 2657). At the same time, different studies show that trust in the institutions involved in the conventional energy industry is low (Mumford and Gray 2010, Goulden et al. 2014).

3.5. The wind energy cooperative model

According to the traditional theory of the firm, the ownership structure of an organization is defined by the allocation of two formal rights: the rights on residual decision-making power and the rights on residual surplus. The beneficiaries of these two rights are respectively called the *dominant category* and the *beneficiary category*. These criteria make it possible to derive one crucial distinction between Third Sector organizations and traditional for-profit firms: contrary to the latter, the dominant and beneficiary categories of Third Sector organizations are distinct from investors (Gui 1991). In the case of cooperative firms, the dominant and beneficiary categories are constituted by their users. In addition, their ownership rights take a very specific configuration. On the one hand, net earnings are usually divided pro rata among the members according to the volume of transactions they have realized with the firm.

Moreover, this distribution is constrained in various ways, the limitation of profit redistribution being, indeed, one of the cooperative firm's principles (Levi 2005). On the other hand, they present a democratic governance, implying equal individual voting rights and the absence of barriers to entry for new members. As to renewable energy cooperatives, they are "consumer" cooperatives. This means that energy users, i.e. regular citizens, constitute the dominant and beneficiary categories.

The two sides of cooperative ownership mentioned above refer to a different notion of justice: while the beneficiary category is more concerned with distributive justice, the dominant category relates to procedural justice, i.e. participation in decision-making processes. If energy users are the residual claimants on the organization's surplus and decision-making power, they are likely to feel more fairly treated and would accept the outcome more easily.

It has been argued that cooperatives benefit from a high level of trust, thanks to their peculiar features (Hansmann 1996). In effect, these are supposed to be less likely than their for-profit counterparts to exploit opportunistic behaviors stemming from the asymmetric distribution of information between agents, due to their constraint on the profits distribution and their democratic governance. This provides them with a competitive advantage for the production of goods and services characterized by a high degree of trust and unobservable quality. Consumer ownership further contributes to the trust capital of cooperatives, since this gives the guarantee to non-controlling stakeholders that the firm is managed by people who share their interest (Spear 2000). These characteristics of the cooperative model are consistent with the finding that horizontal networks, where people have equivalent status and power, engender trust because they facilitate exchanges of information, whereas hierarchies tend to inhibit information flows due to asymmetric power relationships (Kasperson et al. 1999).

The characteristics of these organizations thus seem to meet the aspirations of justice and trust which are crucial for the social acceptability of wind farms. It is important, nonetheless, to confront these normative claims with empirical data. The rest of this article is devoted to this exercise.

4. Methods

In order to fully understand the relationship between cooperative ownership and attitudes toward onshore wind power, a “mixed methodology” approach is adopted. First, the aforementioned relationship is tested statistically by conducting propensity score matching estimation based on quantitative data. We then turn to our qualitative data and conduct an in-depth analysis of interviews with cooperative members. The latter were systematically selected based on the econometric analysis, in order to explore the causal mechanisms underlying the statistical relationship obtained.

4.1. Field setting and data collection

Household data on cooperative members and non-cooperative members are used from an online questionnaire survey that was conducted from April to June 2014. The questionnaire was designed to collect data on indicators of the dependent variables and the key covariates. Cooperative members belong to one cooperative located in West-Flanders. Email addresses were provided by the cooperative. The cooperative was founded in 2000. It launched two wind projects located in West-Flanders, close to the Belgian coast, in 2005 and 2007. They involved the implantation of two and three wind turbines respectively. Table 1 presents some general characteristics of the latter.

Table 1. General characteristics of the cooperative in 2013.

Year of creation	2000
Number of full-time equivalent workers	5.37
Number of members	2,391
Total capital (in euros)	4,781,500
Average number of shares/member	8.00
Average membership period (in years)	4.88

Source: created by author based on information provided by the cooperative.

849 emails have been sent to cooperative members. In addition, it was decided to hand out a paper version of the questionnaire during the General Assembly of the organization, with the objective of reaching a profile of people who otherwise would not have been reached by the online questionnaire. Indeed, the participants to the General Assembly are typically an older public who, presumably, may have a lower usage of the Internet. 43 paper versions of the questionnaire have been handed out during the general assembly of the organization. Thus, 892 versions of the questionnaire were distributed in total. After some data cleaning, a final sample of 222 respondents was used in the analysis. This represents a response rate of 25%, which is comparable or higher to response rates obtained in similar surveys (e.g. Litvine and Wüstenhagen 2011). In addition, data were collected for individuals who do not belong to a cooperative, but who present a very similar socio-demographic profile (n=501). The data collection for this control group has been outsourced to the survey institute IPSOS. This institute has at its disposal a respondent panel representative of the Flemish population. Quotas were imposed so that the control group has the same characteristics in terms of sex, geographical location and education level as the reference group. The idea was to get a control group that differs from the reference group only by not belonging to a renewable energy cooperative.

4.2. Estimation method

4.2.1. Dependent variables

The econometric analysis was performed for three different dependent variables. The first one is the attitude toward renewable energy in general. The second dependent variable is an index that captures individuals' attitudes toward onshore wind turbines. The third dependent variable captures the individuals' reaction to the installation of a wind turbine in their direct neighborhood. The response scales are based on a series of items that ask respondents to indicate on a five-point scale the extent to which they agree or disagree with different statements. For simplicity of the analysis, we then transformed these three outcome variables into binary variables taking the value 1 if the score is above the median–reflecting strong positive attitudes–and 0 otherwise.

4.2.2. Identification strategy

The matching method is used as an identification strategy to estimate the average treatment effect on the treated (ATT)[3], defined as

$$E(Y_1 - Y_0 | T = 1)$$

Once an individual is a cooperative member, it is not possible to observe her attitudes had she not joined the cooperative. This relates to the fundamental problem of causal inference: one is unable to observe the outcomes of the same unit in both treatment conditions at the same time. The underlying motivation for the matching method is to construct an *ex post* counterfactual group that is very similar to the group of cooperative members in terms of key observables covariates that are believed to affect both attitudes toward wind power and selection into the cooperative. The matching method pairs each cooperative member with non-members with the same values for selected observable characteristics, so that the only remaining relevant

[3] The average treatment effect (ATE) requires stronger identifying assumptions: it is only identified if, for *all* controls a treated unit exists. In our case, our nontreated group is much larger than our treated group, which makes the use of ATE irrelevant.

difference between the two groups is the participation to the cooperative. By doing so, this technique mimics random assignment in a nonexperimental setting.

Propensity score matching (PSM) estimators were used in the analysis. Two key assumptions underly the use of PSM: the conditional independence assumption (CIA) and the balancing property of the propensity score. The latter states that the covariates for the treated group and the control group are on average the same, conditional on the propensity score. On the other hand, the CIA implies that selection into treatment occurs only on observables covariates.

$$T \perp Y_0 | X$$

$$\Pr(T = 1|X) < 1$$

Hence, an unbiased estimator requires that all variables related to both treatment assignment and the outcome were included. In the present case, people's environmental awareness may simultaneously affect the decision to join the cooperative and attitudes toward wind turbines. This factor should thus be controlled for. To do so, an index which captures individuals' environmental orientation has been constructed, based on two dimensions: pro-environmental self-identity and ecological daily behaviors. Table A1 in appendix reports the items composing this index, along with statistics to test for internal consistency (item-total correlations and Cronbach's alpha). The results indicate good internal consistency and support combining the items into a summated scale.

However, variables that may have been affected by the treatment should not be included in the matching process (Stuart 2010). Since this environmental orientation index was collected post treatment, it could have been affected by the participation to the cooperative and, therefore, might not be a suitable covariate. There are different responses to this problem. First, as Rosenbaum (1984) notes, adjustment for a posttreatment variable can still lead to unbiased ATT when it is a plausible *surrogate* for the unobserved pretreatment variable.

Individuals’ environmental orientation may be considered as a surrogate if it is a characteristic that is stable over time. Second, instead of the environmental orientation index, relevant pretreatment variables can be included in the matching process. To this purpose, two relevant pretreatment variables were collected: the “green” character of electricity supplier and the presence of solar panels. Third, the sensitivity of estimates to assumptions about unobserved covariates can be examined with the help of suitable tests. In this perpective, a sensitivity analysis was performed based on Rosenbaum’s bounds. Table 1 presents the description and summary statistics of the matching covariates used in the analysis.

Table 2. Summary statistics and description of matching covariates used as controls to form counterfactual samples.

Variable	**Description**	**Statistics for cooperative members**					**Statistics for control group**				
		Obs.	*Mean*	*Standard deviation*	*Min*	*Max*	*Obs.*	*Mean*	*Standard deviation*	*Min*	*Max*
EDUC1	=1 if universitary education	222	0.25	0.43	0	1	502	0.24	0.42	0	1
EDUC2	=1 if sup. non-universitary education	213	0.52	0.50	0	1	501	0.47	0.50	0	1
EDUC3	=1 if sup. secondary education	213	0.18	0.38	0	1	501	0.24	0.43	0	1
EDUC4	=1 if inf. secondary education	213	0.03	0.18	0	1	501	0.05	0.21	0	1
AGE	Age in years	221	52	12	19	86	502	47	11	19	65
GENDER	=1 if individual is a man	219	0.84	0.37	0	1	502	0.77	0.42	0	1
WINDMILL	=1 if individual lives close to a windmill	220	0.16	0.37	0	1	502	0.11	0.31	0	1
INCOME1	=1 if household income higher than 4000 €/month	222	0.20	0.40	0	1	502	0.18	0.38	0	1
INCOME2	=1 if household income between 2000 and 4000 €/month	222	0.46	0.50	0	1	502	0.45	0.50	0	1
ANTWERP	=1 if individual lives in province of Antwerp	215	0.12	0.33	0	1	500	0.23	0.42	0	1
WESTFLAN	=1 if individual lives in province of Western Flanders	215	0.56	0.50	0	1	500	0.21	0.41	0	1
EASTFLAN	=1 if individual lives in province of Eastern Flanders	215	0.16	0.37	0	1	500	0.25	0.43	0	1
BRABANT	=1 if individual lives in Flemish Brabant	215	0.10	0.30	0	1	500	0.17	0.38	0	1
LIMBURG	=1 if individual lives in Limburg	215	0.06	0.24	0	1	500	0.13	0.34	0	1
GREEN	=1 if green supplier before joining the coop.	222	0.06	0.24	0	1	502	0.43	0.50	0	1
PVPANELS	=1 if solar panels before joining the coop.	215	0.18	0.38	0	1	502	0.19	0.39	0	1
ENVORIENT	=1 if environmental orientation higher than 3 (on a five-point scale)	222	0.93	0.26	0	1	502	0.71	0.45	0	1

Source: survey (2014).

When using PSM, the comparison group for each treated individual is chosen with a predefined criteria of closeness (based on a predefined measure of distance) between the propensity scores for treated and controls. Given this measure of closeness, the next step is to implement a matching method which assigns particular weights to associate the selected set of nontreated units to each treated unit. In order to test for the sensitivity of the results, two different matching estimators are used: the nearest-neighbor propensity score matching estimator and the kernel propensity score matching estimator[4]. All matching is done across the full vector of control characteristics. For all propensity score estimators, a common support is imposed.

5. Results of the quantitative analysis

5.1. Matching analysis

Table 3 presents the different treatment estimates. For each dependent variable, two regressions were performed: one which includes the variable *environmental orientation* (columns a) and one which does not (columns b). The estimated treatment effect of joining the cooperative is small and weakly significant as regards the attitude toward renewable energy. In contrast, joining the cooperative increases the attitude toward onshore windmills and the support to locally implemented windmills by about a third of point and the effect is statistically different from zero. Adding the variable *environmental orientation* increases the effect of cooperative ownership.

[4] All the matching results use the ado-file psmatch2 in Stata provided by Leuven and Sianesi (2003). A logistic regression is employed to estimate the propensity score.

Table 3. Estimates of the average treatment effects on the treated (p-values in parenthesis).

	Attitude toward renewable energy		Attitude toward onshore windmills		Reaction to windmill	
	(a)	(b)	(a)	(b)	(a)	(b)
Propensity score kernel matching	0.136*** (0.000)	0.062 (0.165)	0.397*** (0.000)	0.324*** (0.000)	0.382*** (0.000)	0.279*** (0.000)
Nearest neighbor matching	0.190*** (0.000)	0.111* (0.072)	0.410*** (0.000)	0.333*** (0.000)	0.4*** (0.000)	0.278*** (0.000)
Observations	700	700	700	700	700	700
Treated	201	201	201	201	201	201
Controls	499	499	499	499	499	499
Comm. Support	694	679	694	679	694	679
Off support	6	21	6	21	6	21

Notes: columns a include individuals' environmental orientation as a control while columns b do not.

* and *** respectively indicate significance at the 10% and 1% level.

5.2. Robustness checks

5.2.1. The balancing property

Balancing tests were conducted for the propensity score estimators. In order to test the balancing property, the procedure developed by Leuven and Sianesi (2003) was used, i.e. a likelihood ratio-test of the joint insignificance of all the covariates after matching. For the balancing property to hold, the test should not be rejected. In other words, the difference in covariates means between treatments and controls should not be significantly different from zero when tested jointly. The comparison of the likelihood-ratio test statistics and their corresponding p-values for the unmatched and matched sample confirms that in the latter no explanatory power is left to the covariates. This, in turn, makes it possible to attribute the differences in outcomes between the treatment and control groups to the belonging to the cooperative.

Table 4. Balancing property

	Propensity score kernel matching	Nearest neighbor matching
Unmatched Mean bias	27.1	27.1
Matched Mean bias	6.2	8.8
Unmatched Pseudo R^2	0.307 (0.000)	0.307 (0.000)
Matched Pseudo R^2	0.019 (0.905)	0.032 (0.391)

Source: authors.

5.2.2. Sensitivity analysis

The robustness of the results to possible deviations from the CIA was also tested. That is, if cooperative members and matched non-members differ in some unobservable way that affects attitudes toward wind power, the estimates will be biased. To test the sensitivity of the results to hidden biases, Rosenbaum bounds are used to determine how strongly an unmeasured confounding variable must affect the selection process in order to undermine the conclusions of the matching analysis (DiPrete and Gangl 2004).

The probability to join the cooperative can be modeled as a generalized function of a vector of observed characteristics x_i and a linear unobserved characteristic: $P_i = P(x_i, u_i) = F(\beta x_i + \gamma u_i)$, where u_i is an unobserved covariate so that $0 \leq u_i \leq 1$. If there is no hidden bias, $\gamma = 0$ and the participation is entirely determined by x_i. Let us consider a matched pair of individuals with identical observed covariates and let us assume that F is a logistic distribution. Then, the odds ratio between individual i who receives the treatment and the matched control individual j is: $P_i\,(1 - P_{j)}/P_j(1 - P_i) = exp\{\gamma(u_i - u_j)\}$.

Due to the bounds on u_i, a given value of γ constrains the degree to which the difference between selection probabilities can be a result of hidden bias. Let us define Γ = e^{γ}. Both matched individuals have the same probability of participating only if Γ = 1, that is, γ = 0. This implies that there is no hidden bias. Increasing values of Γ imply that unobservables play an increasingly important role in the selection decision (Ferraro et al. 2007). In this sense, Γ is a measure of the degree of departure from a study that is free of hidden bias (Becker and Caliendo 2007).

Table 5 presents the results of the Rosenbaum bounds analysis.

Table 5. Rosenbaum critical *P*-values for treatment effects.

Γ	**Test of the null of zero effect for**		
	Attitude toward renewable energy	Attitude toward onshore windmills	Reaction to windmill
1	3.40E-08	0	0.00E+00
1.5	0.000	3.40E-14	3.50E-12
2	0.000	3.00E-09	1.40E-08
2.5	0.002	2.70E-06	2.40E-06
3	0.005	0.000	0.000
3.5	0.013	0.004	0.001
4	0.026	0.026	0.004
4.5	0.044	0.098	0.015
5	0.067	0.237	0.039

The estimated positive treatment effects remain significantly negative even in the presence of substantial unobserved bias. The results imply that if an unobserved covariate caused the odds ratio of listing to differ between listed and unlisted cases by a factor of as much as 4.5, the 90% confidence interval would still exclude zero.From this analysis it can be concluded that the positive estimated effects are robust to the presence of unobserved bias

6. Exploring the underlying causal mechanisms

6.1. Case selections and interview methodology

This quantitative analysis is complemented with in-depth case studies, consisting in semi-structured interviews of cooperative members who participated to the survey. Indeed, multi-method scholars have argued that case-study research can contribute to causal inference by exploring areas of relative weaknesses for quantitative methods. In particular, case studies can be informative about the causal mechanisms that connect the treatment to outcome (Weller and Barnes 2014).

Selecting cases for in-depth case-study analysis, however, is a challenging endeavor. When data are available, standard statistical techniques can be used to select cases in a systematic way. Individuals were selected on the basis of the extreme value criterion. “An extreme value is understood here as an observation that lies far away from the mean of a given distribution; that is to say, it is *unusual*" (Seawright and Gerring 2008: 301). Whether an observation is interesting for case study analysis depends on its rareness, not on its negative or positive sign. Selection of cases taking extreme values on the dependent variable, Y, is particularly useful for determining causal pathway, because extreme cases on Y have a relatively high chance of also displaying unusual values on any existing pathway variables. Extremity (E) for the i^{th} case is defined as follows:

$$E_i = \left| \frac{Y_i - \bar{Y}}{s} \right|$$

Where $\bar{Y}$ is the sample mean and s is the standard deviation for the variable Y[5].

The objective of conducting of these interviews was to understand the mechanisms through which the participation to a cooperative fosters positive attitudes toward onshore wind. The interview guide remained open, according to the methodology of semi-structured interviews, but particular attention was drawn on mechanisms that had already been highlighted by the literature and mentioned above, including the NIMBY explanation, procedural justice, distributive justice and trust in the developer.

In total, 10 interviews were conducted, all of which were digitally recorded and fully transcribed. Interview transcripts were systematically analyzed to identify elements linked to the relationships between the belonging to the cooperative and attitudes towards wind turbines. Relevant quotes were collected in a separate file, after translation into English when necessary.

[5] This definition of extremity is the absolute value of the Z-score for the i^{th} case (Stone 1996, 340).

6.2. Results of the qualitative analysis

6.2.1. The NIMBY explanation

One first mechanism, which directly follows from the NIMBY explanation, consists in stating that by providing private financial benefits linked to direct contribution, renewable energy cooperatives transform a pure public good–wind power–into an impure one, which provides public and private characteristics as a joint product. This helps overcome the collective-action problem mentioned above. According to such reasoning, cooperative members would be primarily motivated by financial payoffs to join the cooperative. It would also be the case that people who oppose wind turbines become in favor of them when they are offered a financial compensation. Hence, to assess this explanation, I tried to identify respondents' justifications in terms of self-interest and personal benefits.

Several respondents explained that they expect some guarantees about their investment, but that their choice of joining the cooperative was not primarily motivated to financial rewards. "I don't have to have huge gains by investing. But I don't want big losses either" (Cooperative member 3). In the following extract, the member even consciously admits that investing in a cooperative would not be what a pure financial cost-benefits analysis would dictate: "If you want to go for the dividend, you know, go for something else. I mean, if it's about the money, then you don't have to be there. […] If you go to the stockmarket, you get much more. So I mean, if it's about the money, then you're making a bad choice […] The main driver was always to say: there is a positive story going on here, in which I can participate with my money. I could also participate also in things that I don't really support myself but they make more money with, but that's not what I want, that's not the world I want to build. So that's not what I'm going to invest in either. You see? So I could make smart choices with my money, but, in the long term, it wouldn't create the world I want to live in or that I want to leave to my children […] So I won't do that because you get much more than a financial reward." (Cooperative member 1).

Even the motivations of members who do not adhere to the cause of wind power go beyond monetary benefits. This interviewee is not in favor of wind turbines, but believes that the participation of a large number of people, including people, is more likely to guarantee the respect of all stakeholders' interests. « I became a shareholder, because I hope a group of shareholder can decide in a more human way than just concentrating on profits. Profits are one of the aspects and of course if we can make profit, all the better. But not profit at any cost. If I had the impression that it went that direction, I would probably withdraw my shares and try to look for another cooperative that gives me more guarantees" (cooperative member 3).

6.2.2. Trust

Several interviewees mentioned the "closeness" of the cooperative as compared to traditional actors. This closeness is sometimes related to the geographical location., but not necessarily so, because even members living relatively far away from the cooperative had the feeling that the cooperative is "close" to people, especially as compared to multinational energy groups. The not-for-profit status displayed by cooperatives was also highlighted by interviewees to be an important source of trust.

Yet the trustworthiness of cooperatives depends on different contextual factors. One of them is the size of the organization, whose relationship to trust is ambiguous. On the one hand, a limited size seems to lead to a higher the propensity to trust. "I think that 'small-scaleness' offers more opportunities to get people involved", a member said. In the same perspective, a smaller size is sometimes associated with lower risks of mission drifts: "whenever it gets too big, the risk increases that somebody takes [the power], because it's more difficult to have a look".

The degree of professionalization of cooperatives seems to play a role as well. As an expert pointed out, talking about Walloon cooperatives which emerged more recently than their Flemish counterparts, “at first cooperatives were emanations of handful citizens who were of good will, but who weren’t always experts in all fields. They were not yet very professional at that stage, and this generated an image that was not always positive, an image of amateurish activists”.

In that respect, it is also interesting to compare citizen initiatives with top-down cooperatives. On the one hand, big players are able to offer substantial financial guarantees for individuals who seek to invest in renewable energy. On the other

6.2.3. Procedural justice

Several Interviewed members mentioned the importance of feeling involved in the decisions about the project and the fact that the cooperative allowed them to express their views, including potential objections and disagreements. « I have the idea that working in a cooperative way brings more information to the people and the feeling that I have something to say in this. Even if you are one against one hundred others, you still have the ability to speak up to say: ‘I think this and that is important’. Whereas in another situation, big companies come and say: "we're gonna do this here". If you don't like it or if you like it, there's no way to express your feelings towards the project.” (Cooperative member 2).

They also emphasized the importance of being involved from the start of the planning process: “It would probably oblige the planners to take more into account all the aspects involved. Not just: we want windmills. But ok, do we want windmills at whatever possible costs? And not just financial costs but also social, environmental, etc. I mean environment is not only the air, it is also the way people can live, it is also silence or noise” (Cooperative member 3).

“Maybe you can help make the final decision on where to put it. or you can stand up for your neighbors and say: ‘if you just put it 100m more over there, maybe it's better for everyone’. Whereas a normal company would just say: we studied it, this is the place with the highest benefit and the lowest cost, so we do it here” (Cooperative member 3)

“Participation is not just a vote, it's co-creating our future, our own future like: what do we want, in which way do we want it? […] And it shouldn't be at the end, like which colour of wind turbine do you want? No, it's too late. So you have it really at the beginning, you should confront to people and tell them: we have a problem with electricity supply, what do we want to do about it?” (Cooperative member 1).

These planning elements relate to the importance of timing in the participation process. The cooperative was founded five years before the first windmills were erected and citizens were thus involved in the project from the very beginning. This approach contrasts with the general situation in Flanders, where the competitive environment prevents developers from engaging the local population before the project is planned. As a result, citizens generally have to choose between approving and rejecting a fixed plan.

6.2.4. Distributive justice

Different factors seem to influence the perceived distributive justice within the cooperative. Again, the limited scale of operations increases perceptions of distributive fairness: « I think the risk that means are led into a direction where they serve only a small group of people who profit from the others, that the risk is smaller if more people have to share the decisions. And that the chance is bigger that you can sort of, prevent taking power into very few hands.”

Another interesting fact is that in 2012, BeauVent decided to limit the number of shares that people are allowed to buy. From then on, new members can only buy one share, and larger share issues are launched only when BeauVent develops new projects. Two respondents emphasized this limitation as important to avoid concentrated shareholding. “I would probably tend to withdraw my shares if I find out that at BeauVent for instance somebody is collecting too many, so I find it very important, and in that sense I believe in companies which say, you can't buy as many shares as you want, I mean, it's just limited. They don't want anybody to have all the shares in the end or at least 50% or so.” (cooperative member 3)

6.2.5. Emotional attachment to windmills

it appears that in some cases, an emotional connection can establish itself between cooperative members and the windmills, a phenomenon that can be related to the concept of psychological ownership, i.e. the feeling of possessiveness and of being psychologically tied to an object (Pierce et al. 2001). In this perspective, several interviewees stressed the contrast between a purely financial investment and investments into real and tangible assets: “You know, money is very abstract. It's really an idea. And if you can tight that money to something that is very tangible, it becomes very different. […] The same happens if you buy a little bit of a wind turbine. You know, this piece is mine! It doesn't mean anything, mine, I mean a piece of wind turbine can't operate by itself. You need the entire wind turbine, because it can't work, of course. But still, you're attached to it in a different way. So it is important to use this tool of money to bring you directly to something that you feel or can associate with and that for you has a positive story. » (Cooperative member 1)

“you could for example take your bike and make a bike tour on a beautiful spring day, and say: "ho let's cycle to this wind turbine!" Because it's owned by the cooperative, I have a part. So you go there and you cycle and you have a look at the wind turbine, it's just a wind turbine, and then you cycle back. […] So it's a completely different attachment than if you bought an anonymous share of whatever stock company, which you never have even seen. Or with your bank account, I mean, I never go check how much money I have today” (Cooperative member 1). “For me, it's a nice thing to say: part of it is mine. One little bolt or whatever, I paid for that... Without me, it wouldn't have been there... It would have been there of course, there would have been someone else to pay my share, but that's an idea that makes me [feel] emotionally attached to it” (cooperative member 2).

One member mentioned that he seeks to use this emotional connection to increase his children’s awareness about wind energy: “In the time of the windmills, when we were building this house, we moved to a little apartment a few doors away from here. It was on the third floor and we could see the windmills. So the children were smaller and I said: ‘you see these six windmills? That one is ours! Just a little bit of it’. Maybe they get, in that way, a little emotional involvement” (Cooperative member 2).

These findings tend to contradict the assumption underlying the creation of “top-down” cooperatives, according to which it does not matter whether or not people are actually co-owners of the assets, as long as they are financially engaged in the project. Further testing this emotional attachment through the involvement of the ownership of wind turbines constitutes a promising task for future studies.

7. Discussion

Based on matching analysis, the study highlighted a positive and robust effect of joining a cooperative on attitudes toward onshore wind power. The analysis of systematically selected cases revealed interesting insights about the underlying mechanisms of this positive relationship. First, qualitative findings tend to contradict the NIMBY explanation. Second, perceived procedural and distributive justices, as well as trust in the developer, seem to be essential elements. Interestingly, Cooperatives respond to both distributive and procedural justice at the same time given the two sides of ownership rights. Third, the analysis highlights a phenomenon of emotional attachment of cooperative members This questions the assumption that the creation of top-down cooperatives rely on, namely the fact that people are actually involved in the ownerhip of assets does not matter.

The results suggest that cooperative ownership is a particularly relevant institutional setting for enhancing social acceptance of wind turbines. Policy makers willing to prop up such acceptance should encourage the development of these organizations by creating favorable conditions. This could be the adoption of planning policies other than the “first-come, first-served” system, which would give greater importance to the participatory aspects. And the design of support mechanisms of green energy that do not favor incumbent actors. Quorum for participation is clearly a step forward, but is not a sufficient condition.

8. Conclusion

Despite the major contribution onshore wind power could bring to the development of renewable energy in Belgium, this technology suffers from a limited social acceptability. Cooperative ownership of windmills present characteristics that are likely to facilitate this social acceptability, such as a fair distribution of costs and benefits associated with projects, further citizen participation in decision-making processes and the establishment of trust between the developer and residents. The goal of this article was to test the empirical valididty of such claim. Results confirm that the participation to a cooperative significantly increases the positive attitude toward this technology. Results suggest that the implementation of an institutional context favorable to this form of ownership and active support to a genuine citizen participation in wind power could largely contribute to the development of this sector.

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