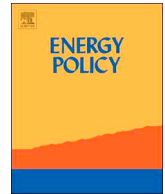




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Analyzing the determinants of the size of investments by community renewable energy members: Findings and policy implications from Flanders



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ABSTRACT

Community renewable energy initiatives are increasingly recognized as important actors to trigger citizen investments in renewable energy facilities. Little is known, however, about the factors that determine the size of financial investments made by community renewable energy members. To address this gap, this paper presents a multivariate econometric analysis of the economic, social, environmental and institutional determinants of the size of investments in community renewable energy. It relies on a large-scale survey of 4061 members of two renewable energy cooperatives located in Flanders, in the northern part of Belgium. Results show that the return on investment is the most important determinant for members of large communities of interest, while environmental, social and other non-economic drivers tend to dominate financial motives for members of smaller communities of place. The presence of other cooperative members in close social networks plays a particularly important role in the latter kind of communities, highlighting the strength of social interactions as a driver for investments. These results can help policy-makers to design more adapted policy measures for fostering financial investments at the community level, and project developers to tailor segmented communication strategies about the goals and benefits of projects.

1. Introduction

In order to meet the 2 °C goal, an estimated \$1 trillion per year of investment in renewable energy (RE) projects is needed through 2050 and a large investment gap still exists (Buchner et al., 2017). Given the size of required investments, the role that citizens and civil society actors may play in this respect has been highlighted in recent years. In particular, community ownership of renewable energy has attracted growing interest in academia and beyond (Bauwens, 2017b). For instance, in 2016 the European Commission recognized for the first time, in a proposed legislative measure of the Clean Energy Package, the role of community-based energy projects in the energy transition. Community participation in RE deployment has been pivotal for financing the transformation of energy systems in several countries, notably Germany and Denmark, but also Austria and Sweden (Bauwens et al., 2016; Yildiz et al., 2015; Wizelius, 2014). In addition to contributing to close investment gaps, some evidence indicates that community ownership may improve local acceptance of RE projects (Bauwens and Devine-Wright, 2018; Warren and McFadyen, 2010; Musall and Kuik, 2011; McLaren Loring, 2007). Moreover, the high transaction costs for small-scale decentralized renewable energies faced by large players like electric utilities and institutional investors calls for new financing models at the local level (Salm et al., 2016; Yildiz, 2014).

Given these recent evolutions, the concept of “community energy” is trending both among scholars and practitioners. Community energy describes initiatives where citizens come together to tackle diverse aspects of low carbon energy transitions, including the development of projects to generate heat and power from RE sources. To be sure, community and energy are both polysemous terms. Community can mean a type of actor, a scale of activity, a spatial setting, a form of network or a type of process (Walker, 2011). Energy can refer to RE for heat and power, fuel poverty, awareness raising, smart energy or combinations of those (Berka and Creamer, 2018). Despite this inherent ambiguity, consensus has emerged that community energy projects involve several key aspects, notably high levels of community participation or local ownership, coupled with high levels of local benefit sharing (e.g. Walker and Devine-Wright, 2008; IRENA Coalition for Action, 2018). For instance, Hicks and Ison (2018) proposed that to identify “genuine” community energy initiatives, five distinct attributes should be present in a given project: locally appropriate scale of technology deployment; early and extensive community engagement; participatory decision-making; involvement of local actors and communal distribution of financial benefit. In this article, the term “community renewable energy” (CRE) will be used to specifically refer to projects involving community-based ownership of RE, in order to differentiate them from other activities, e.g. demand-side initiatives.

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Much empirical evidence for individuals' motivations to join and invest in CRE initiatives relies on qualitative data with small samples of participants (e.g. Bomberg and McEwen, 2012; Schreuer, 2012; Dóci and Vasileiadou, 2015). When these motivations have been analyzed quantitatively, the focus has generally been on intentions to join among non-participants rather than on motivations of actual members (J. Rogers et al., 2008; Bamberg et al., 2015; Kalkbrenner and Roosen, 2016; Koirala et al., 2018). The few studies concerned with the motivations of actual members have concentrated on the binary decision of participating or not in CRE projects, but have often overlooked the size of investments (Fleiß et al., 2017; Maruyama et al., 2007). Bauwens (2016) and Holstenkamp and Kahla (2016) are the only studies, to the best of the author's knowledge, which empirically address this question. However, they present descriptive and/or bivariate analyses of the size of investments, but do not investigate its determinants in a multivariate setting. The present study distinguishes itself from these previous contributions by conducting a multivariate analysis of the factors that determine the size of investments made by members in CRE projects. It thus has the clear advantage over extant studies of rigorously disentangling the roles of different factors in stimulating financial contributions in CRE projects. In addition, this study improves over previous research in the field by considering the role of institutional factors and, more specifically, the importance of a democratic governance in addition to the economic, social and environmental factors commonly under scrutiny. Indeed, to the author's knowledge, this dimension has not yet been studied in this context, despite its centrality in CRE initiatives. Accordingly, the empirical analysis in this article assesses the following research question: *how do economic, social, environmental and institutional factors influence the size of investments in community renewable energy initiatives?* The economic incentives considered here are the return on investment and a lower electricity price, while social and environmental factors respectively include, on the one hand, the social identification with the cooperative, the presence of other members in close social networks and the importance of other members' influence or advice in the decision to join a CRE initiative and, on the other hand, members' pro-environmental self-identity and the importance attached to the production of renewable energy.

To answer this question, the present study focuses on a specific CRE model, namely RE cooperatives, for two reasons: first, RE cooperatives are internationally numerous. For instance, the European Federation of Renewable Energy Cooperatives, REScoop.eu, currently counts about 1500 members across thirteen European countries involving around 1,000,000 shareholders. Second, "cooperatives are a particularly suitable model to ensure the financial viability of small-scale projects through fundraising among community individuals compared to other models depending on grants or loan schemes" (Bauwens et al., 2016, 140). The cooperative model is characterized by an ownership structure controlled by their members/users rather than external investors, a democratic governance involving equal individual voting rights ("one person, one vote") and low barriers to entry for new members. In addition, while a return on cooperative shares is allowed, it is generally subject to a cap, suggesting that maximization of return on capital may not be a key objective.

The following sections of this article present the conceptual framework underpinning this investigation (Section 2), the methodology used (Section 3), the empirical analysis and the discussion of the results (Section 4), and some concluding remarks about their policy and management implications (Section 5).

2. Conceptual framework

Building upon behavioral finance and institutional theory, previous research on investment decisions in RE has highlighted that these are not purely driven by financial motives, but may be influenced by various non-financial factors (Masini and Menichetti, 2012, 2013), including demographic variables, financial and technical knowledge and

attitudes (e.g., towards the environment or the power generation system) (Gamel et al., 2016; Nilsson, 2008; Ameli and Brandt, 2015). This resonates with the literature on household finance, which shows that households' investment behavior depends on different variables including sex, age, attitude to risk, marital status, educational background and life situation (Campbell, 2006; Guiso and Sodini, 2013). Furthermore, the literature has shown that RE investors are heterogeneous, with differences not only between corporate, financial and retail investors (Wüstenhagen and Menichetti, 2012), but also among the latter group and even within the group of community investors (Bauwens, 2016; Ebers Broughel and Hampl, 2018). This stresses the need for segmented policy and management approaches (Bergek et al., 2013). Similarly, previous literature on CRE projects focusing on individual motivations for joining these initiatives have highlighted a multiplicity of drivers. In the current article, economic, social and environmental dimensions are considered, following the lines of reasoning adopted by several studies (Bauwens, 2016; Kalkbrenner and Roosen, 2016; Radtke, 2014; Holstenkamp and Kahla, 2016; Fleiß et al., 2017). In addition, the democratic nature of cooperative governance is included as an additional potential determinant of financial investments.

First, people may be driven by economic incentives. These can take various forms, as CRE initiatives may adopt a wide diversity of business models with differing financing modalities.¹ In particular, CRE projects may offer a return on the investments made by members. As mentioned above, in many not-for-profit organizations, like cooperatives, the return on investment is subject to a cap, making them less attractive for investors seeking to maximize their economic return (Huybrechts and Mertens, 2014).² As another economic incentive, when CRE organizations directly supply energy to their members, they may offer an energy price that is lower than those of competitors. This is for instance the case of the cooperative Ecopower in Flanders, which supplies electricity to its members at a price lower than those of other suppliers and, as a result, has spurred many people to become cooperative members in this region (Bauwens, 2016).³ Finally, although CRE organizations are focused on energy generation and retail, they may also in certain cases promote the adoption of energy conservation or efficiency measures among their members. The resulting cost savings may constitute an additional source of economic incentive (Bauwens and Eyre, 2017).

Second, people may also invest in CRE projects for social motivations. Three different perspectives on social motivations are considered here, because they have been highlighted by previous studies as particularly important in the context of CRE: relational goods, social identity with the group, and peer effects in the adoption of innovations. The idea of relational good developed by Uhlaner (1989) and Gui (1996, 2000) emphasizes that the value of social interactions lie in their non-instrumental nature, or genuineness, as opposed to the exchange of goods and services that may occur in the same interaction, and in the non-anonymity of the parties involved (Bruni and Stanca, 2008).

¹ These models include, for instance, development trusts in Scotland which do not distribute income to individual members, but allocate it to the funding of community development projects, cooperatives which may allow (limited) profit distribution to individual members, and so-called closed-end funds in Germany, which are more similar to traditional for-profit investment vehicles (Enzensberger et al., 2003; Yildiz, 2014).

² For example, in Belgium, the National Council for Co-operation has been established to grant quality certification to cooperatives that share the cooperative ideal. One of the conditions to be accredited by this council is to distribute a return on capital not higher than 6%. Accredited cooperatives then receive certain fiscal and economic advantages.

³ However, this is not necessarily the case. Enercoop in France, a retail cooperative purchasing green electricity from French producers, offers electricity prices higher than those of most of its competitors. Enercoop justifies this differential because of the fair remuneration of its suppliers. It may also be due to its smaller size disabling economies of scale or scope (Huybrechts and Mertens, 2014).

Examples of relational goods include social approval, solidarity, friendship or the satisfaction derived from having complied with a social norm (Uhlener, 1989, 255). By creating empathy among individuals (Bohnet and Frey, 1999), contributing to group identity (Dawes et al., 1988) and fostering norms of reciprocity or cooperation, direct social interactions have been shown to reduce social distance between people and to increase cooperation in different settings (e.g. Ledyard, 1995; Frohlich and Oppenheimer, 1998). Social Identity Theory (SIT) provides a different perspective on the social motivations to invest in CRE initiatives. Indeed, people may invest in such organizations because they identify with the group they belong to. Social identity can be defined as “that part of an individual's self-concept which derives from his knowledge of his membership of a social group (or groups) together with the value and emotional significance attached to that membership” (Tajfel, 1978; 63). The socio-psychological literature on collective action has shown that a strong sense of shared collective identity fosters collective action (Tyler and Blader, 2001), also in the context of community-based pro-environmental or sustainable energy initiatives (Bamberg et al., 2015; Kalkbrenner and Roosen, 2016). A third perspective on social motivations is provided by the treatment of peer effects in the literature on the diffusion of innovations. A “peer” or “peer effect”, depending on the subject of study, may include neighbors, friends, colleagues, or firms. Various papers have demonstrated the importance of peer effects in the diffusion of environmentally-friendly innovations (Axsen et al., 2013; Bollinger and Gillingham, 2012). In particular, the role of opinion leaders has been highlighted as especially crucial in this diffusion process (Rogers, 1995). Opinion leaders are individuals who lead in influencing others' opinions about innovations. They are sought for trusted information about the (technical or financial) performance of innovations. The role of such opinion leaders may also be relevant when looking at investments in CRE initiatives. For instance, almost 30% of the members of the cooperative Ecopower came to know of it by word of mouth, according to a survey (Ecopower, 2013).

Third, people may invest in CRE projects for environmental motivations. Many previous studies have analyzed the determinants of environmental attitudes or concern and their influence on decision making (e.g. Gadenne et al., 2011; Chen, 2014). In particular, environmental considerations have been highlighted as one of the drivers for joining CRE initiatives (Kalkbrenner and Roosen, 2016; Boon and Dieperink, 2014). For instance, Kalkbrenner and Roosen (2016) found that environmental concern had a significant positive effect on the willingness to participate in a CRE initiative. More specifically, pro-environmental self-identity, i.e. “an individual's overall perceived identification with the typical green consumer” (Barbarossa et al., 2017, 191), is a widely recognized predictor of pro-environmental behavior (e.g. Sparks and Shepherd, 1992; Whitmarsh and O'Neill, 2010). In the context of CRE initiatives, Bauwens and Devine-Wright (2018) revealed that pro-environmental self-identity positively influenced their attitudes toward RE sources.

Fourth, people may invest for motives related to the specific institutional features of CRE initiatives and, especially, their democratic governance. Experimental findings show that democratic institutions affect the level of cooperation of parties involved in an economic exchange (Dal et al., 2010). Given a decision or policy, the level of cooperation is higher when decisions are made democratically by involved parties; the same decision or policy imposed undemocratically through another mechanism does not induce similar levels of cooperation. Democratic governance appeals to the norm of procedural fairness, i.e. the fairness and the transparency of the processes by which decisions are made (Gross, 2007). As CRE initiatives use, at least in principle, participatory and democratic governance structures, such an institutional feature is likely to have an influence on private contributions in CRE initiatives. For example, in a somewhat different, but related context, Knoefel et al. (2018) showed that German consumers are willing to pay more for electricity produced by utilities with

participatory and transparent governance structures.

In most cases, these different factors have been found to be present simultaneously, although to a different degree or with different emphasis. In some studies, economic motivations have emerged as the most important ones. For instance, looking at drivers for joining two photovoltaic investment schemes in Austria, Fleiß et al. (2017) found that expectations of financial gains were the main driver behind investments. This result is hardly surprising, though, as the organizations studied were mostly market-oriented and focused on generating commercial profit. Relying on qualitative interviews with members of two Dutch and two German CRE initiatives, Dóci and Vasileiadou (2015) found that expectations of lower energy prices and of some economic return were the key drivers for joining these initiatives, especially in Germany during times of relatively high feed-in tariffs which guaranteed a favorable return for the sold renewable energy.⁴ The protection of the environment emerged as the second most important driver. In other cases, social, environmental or other non-monetary considerations have been found to dominate economic motives. For instance, focusing on CRE organizations in Flanders, Bauwens (2017a) showed that the support for the production of renewable energy was a more important motivation for joining such initiatives than the return on investment or the electricity price. Relying on a survey among members of CRE initiatives in Germany, Radtke (2014) showed that participants' involvement was primarily driven by environmental motivations rather than financial return.

Certain contextual factors also seem to influence drivers for joining a CRE initiative, namely the spatial and temporal dimensions and the business model. Regarding the spatial dimension, a useful distinction can be made between communities of place, which imply a set of social relationships embedded in a particular spatial context, and communities of interest, which are formed by networks and social relationships that can extend beyond specifically place-based networks (Walker, 2011). Environmental and social motives appear to be stronger in communities of place, due to the spatial closeness and the resulting higher frequency of social interactions between members (Bauwens, 2016). Similarly, from a temporal perspective, these non-economic factors tend to be predominant for early members during the pioneer phase of initiatives, but over time financial aspects become more and more important, as the sector moves toward professionalization and attracts more profit-oriented investors (Schreuer, 2012; Bauwens, 2016). Regarding the business model, by definition, economic motivations related to energy retail, like access to a cheaper electricity price, are more prominent in energy retailing organizations compared to organizations active in energy production only (Holstenkamp and Kahla, 2016; Bauwens and Defourny, 2017). In addition, when comparing energy cooperatives to more market-oriented organizations in Germany, Holstenkamp and Kahla (2016) showed that financial motives were more important for members of the latter than for those of the former. Empirically, the effects of the spatial, temporal and business model dimensions can be closely intertwined. For instance, looking at the geographical distribution of the membership of the RE cooperative Ecopower in Flanders, Bauwens (2016) showed that early generations of cooperative members formed communities of place, while later members formed a community of interest. This resulted from the geographical expansion of the activities of the cooperative when it engaged in electricity retailing.⁵

⁴ Since then, conditions have significantly changed in Germany, with the reduction of feed-in tariffs for photovoltaics in 2012, the introduction of a mandatory market-premium system in 2014 and the shift from feed-in tariffs to a tender-based system in 2017.

⁵ The type of technology operated is another contextual factor likely to influence motivations for joining a CRE initiative. In this regard, economic motives tend to be more closely connected to wind energy projects, compared to photovoltaic or biogas projects (Holstenkamp and Kahla, 2016; Schreuer, 2012). Indeed, as the size of investments is usually higher in the case of wind

In conclusion, economic, social, environmental and institutional factors may be expected to have a positive influence on the size of financial contributions made by members of CRE projects, as suggested by the literature reviewed in this section. Moreover, non-economic drivers can be expected to have a stronger positive influence on the size of investments for “early” Ecopower members and for BeauVent members (see ‘Field setting’ section below for details of Ecopower and BeauVent members), who form a community of place, than for “later” Ecopower members, who form a community of interest. The methodology followed to analyze these relationships is presented below.

3. Methodology

3.1. Context

In order to address the aforementioned research question, this paper draws on case study research on two RE cooperatives based in Flanders, Ecopower and BeauVent. The Flemish federation of RE cooperatives, REScoop Flanders, currently counts 13 initiatives. While many of them have been created recently and have a limited membership, Ecopower and BeauVent are relatively well-established, as they are the two oldest organizations. Their membership represents about 87% of members of RE cooperatives in Flanders, ensuring that these cases are representative of the members of such initiatives in this region.

Ecopower was created in 1991 by a former group of students with strong connections with the environmental movement. Since then, Ecopower’s organizational development has gone through three phases corresponding to different economic incentives. In the first phase, from its creation over 1991–1999, the purpose of the cooperative was to gather small amounts of money from motivated individuals to finance the refurbishment of small hydropower installations. Over this period, the cooperative itself was not involved in any energy production activities and no dividend was distributed to members. The second phase corresponds to the 2000–2002 period. It started with the installation of three wind turbines in the city of Eeklo, which was financed by a parallel recruitment campaign. During this period, the cooperative started distributing some return on investment to its members under the form of dividends (the cooperative distributed 6% dividends in each year of that period). The third phase started in 2003, when Ecopower began supplying electricity to its members in the context of the Belgian electricity market liberalization, and extends to the present. Since then, Ecopower’s membership has followed a sustained increase. As it was one of the first green electricity retailers in Flanders and the electricity price was relatively low compared to competitors, many people bought shares to be able to be supplied with green electricity from Ecopower. As a result, Ecopower now counts over 50,000 members. Parallel to its retail activities, Ecopower continues investing in RE projects. Importantly, Ecopower members are only allowed to sell their shares after a period of six years, in order to avoid large fluctuations in the cooperative’s outstanding capital.⁶

In addition, [Bauwens \(2016\)](#) revealed that the members who joined during these different phases have different motivation profiles. Indeed, individuals who joined Ecopower during its two first phases

(footnote continued)

energy, this type of projects may attract more professionalized and economically-oriented investors. However, as wind projects in Germany are often financed and developed via more market-oriented business models, the effects of the technology and the business model on investors’ motivations are likely to be intertwined and would need to be properly disentangled.

⁶ Qualitative evidence from the exploratory analysis (see ‘Data collection’ section) indicates that members are aware of this opportunity to trade shares and make use of it, providing confidence that the current number of shares purchased by members is not a purely exogenous variable. For instance, as a manager of Ecopower said, “There are some membership cancellations after a year of low dividends.”

(1991–2002; $n = 703$) have higher environmental concerns and identify more strongly with their organization than Ecopower members who joined during the third phase (2003–today; $n = 47,716$ in 2013), who are more driven by the access to lower electricity prices. Furthermore, it was shown that the two first cohorts of Ecopower members were more spatially concentrated than later Ecopower members, due to the broadening of the geographical scope of economic operations resulting from the start of electricity retailing. This higher spatial concentration was associated with a higher frequency of social interactions between members. Hence, these results suggested that the first and second cohorts of Ecopower members formed communities of place, while the third generation of members formed a community of interest.

As a large cooperative engaged in electricity retailing, Ecopower is a quite specific case. For this reason, the comparison with the Flemish cooperative BeauVent is insightful. The two cooperatives present several common features: in the two organizations, individuals may become members by purchasing at least one cooperative share. Each share as a nominal value of €250 and gives right to one vote on the organization’s General Assembly and to a limited return on investment (up to 6%). An important difference between Ecopower and BeauVent is that, while the former is an electricity retailer, the latter is not. BeauVent focuses on the development of RE (mostly wind and solar) and energy efficiency projects. A second contrast is the size: as a result of its electricity retail activities, Ecopower is much larger than BeauVent. In 2013, the former was almost twenty times larger than the latter in terms of number of members ([Table 1](#); see also [Bauwens, Huybrechts, and Dufays Forthcoming](#)). [Bauwens \(2016\)](#) also showed that the spatial concentration of BeauVent membership was higher than that of later Ecopower members, suggesting, once again, that BeauVent members formed a community of place.

3.2. Data collection

Data collection for this paper entailed three components: desk research, a qualitative exploratory phase and a large-scale online survey. Desk research started by undertaking searches in Elsevier’s Scopus, Thomson Reuters’ Web of Science and Google with the keywords “community energy”, “motivations” and “investments” (as well as “energy” and “investments” in combination with several synonyms of motivations, such as “motives” or “drivers”, and with terms related to community, e.g. “citizen”, “cooperative” or “local”). Bibliographies of identified relevant studies, e.g. [Walker \(2008\)](#), [Walker et al. \(2010\)](#) or [Huybrechts and Mertens \(2014\)](#), were examined to identify further relevant literature. Overall, more than 20 articles on investments in CRE projects were gathered. These were reviewed by the author of this paper to develop a foundational understanding regarding individual drivers of investments in CRE initiatives. This review aided the construction of a questionnaire which was then pre-tested in the qualitative exploratory phase. This phase consisted in 21 semi-structured interviews with Ecopower and BeauVent managers and members. The objectives of these interviews were to assess whether the wording and the order of the questions were adequate, whether the questions and instructions were clearly formulated and understood by respondents, whether additional questions were needed or whether some questions should be eliminated. The final questionnaire resulting from this pre-test phase then constituted the basis of the third phase.⁷ In this step, an online questionnaire-based survey was carried out between May and June 2014 in order to collect quantitative data on cooperative members. Ecopower and BeauVent provided members’ email addresses. 36,642 emails were sent to Ecopower members and 849 emails were sent to BeauVent members. Moreover, 195 printed copies of the questionnaire were handed out during Ecopower’s General Assembly and 43 in BeauVent’s in order to reach a profile of people who would not have

⁷ The questionnaire is provided in the supplementary material for this article.

Table 1

General characteristics of cooperatives.

Source: created by author based on 2013 data provided by the cooperatives.

	Ecopower	BeauVent
Year of creation	1991	2000
Number of full-time equivalent workers	22	5.37
Number of members	47,419	2391
Price of one cooperative (in euro)	250	250
Total cooperative capital (in euro)	48,328,750	4,781,500

been by the online survey, as General Assembly participants are typically older and may presumably have a lower usage of the Internet. All in all, out of the 37,729 copies of the questionnaire distributed in total, 4061 cooperative members took part in the survey. Although this 10.8% response rate is comparable to that obtained in similar surveys (e.g. Litvine and Wüstenhagen, 2011), some caution is warranted when drawing firm conclusions about the generality of members.

3.3. Variables

3.3.1. Dependent variable: size of investments in the cooperative

As the main analysis presented in this article is centered on the sample of Ecopower members, the detailed descriptive statistics of the variables used in the analysis are provided for Ecopower members only (for more information about the comparison between Ecopower and BeauVent members, see Bauwens (2016)). The size of financial investments in the cooperatives (*NUMBERSHARES*) was measured by the number of cooperative shares purchased. It appeared from the qualitative exploratory phase that the exact number of shares purchased was a piece of information many members did not know precisely. Indeed, some people have been members of the cooperative for over twenty-five years and, therefore, may be subject to memory lapses. Hence, in order to avoid possible biases in the data and maximize the response rate to this question, respondents were asked to indicate on a six-point scale how many shares they had purchased (1 = '1 to 9', 2 = '10 to 19', 3 = '20 to 29', 4 = '30 to 39', 5 = '40 to 49', 6 = '50 or more') instead of providing the exact number of shares purchased. The cooperatives also provided data about the exact number of shares purchased for the entire population of members. Unfortunately, the survey data could not be linked to this data for anonymity reasons. Nevertheless, the distribution of this variable in the sample could then be compared to the population distribution (Table 2). As shown in the table for Ecopower members, the two distributions are very similar. This provides confidence that the dependent variable is a valid proxy for the number of cooperative shares purchased. We can also see from this table that the distribution of the dependent variable is very skewed: a large majority of members purchase one to nine shares (84%), while a minority purchases a large number of shares.

3.3.2. Independent variables

Regarding economic factors, questions were included to assess the importance of the return on investment (*ROI*) and a low electricity price (*PRICE*) as motivations to join the organization. More precisely, respondents were asked to indicate on a five-point scale (from 1 'not at all' to 5 'completely') the extent to which the return on investment and the price per kilowatt-hour played a role in their decision to join the cooperative.⁸

⁸ Cost savings resulting from the promotion of energy conservation or efficiency measures among members have not been included as an additional economic incentive because Ecopower's and BeauVent's business models are focused on energy generation and retail, these measures being only a secondary activity at the time of the survey, as it appeared from the qualitative exploratory phase.

Table 2

Distribution of the dependent variable in the sample and the whole population of Ecopower members.

Source: survey (2014) and information provided by Ecopower.

	Whole population (%)	Sample (%)
1 to 9 shares	84.88	84.24
10 to 19 shares	10.63	10.20
20 to 29 shares	1.49	2.13
30 to 39 shares	0.42	0.47
40 to 49 shares	0.54	0.38
50 shares or more	2.04	2.57

As for social factors, data were collected to cover the three perspectives highlighted in Section 2: relational goods, social identification with the cooperative and peer effects. First, respondents were asked whether or not they had other members within their close social networks (relatives, friends, and neighbors). By focusing on the close social networks, this variable (*NETWORK*) seeks to capture the features of genuineness and non-anonymity that characterize relational goods. Second, social identification with the cooperative (*SOCIDENT*) was measured by five items adapted from existing studies (Tyler and Blader, 2001; Stürmer and Kampmeier, 2003). Social identification entails a cognitive component (a cognitive sense of belonging to a group), an affective component (a sense of emotional involvement with the group) and an evaluative component (a positive or negative value attached to membership; Ellemers et al., 1999). Accordingly, indicators of these different aspects were collected. The cognitive component was measured by three items: 'I have a lot in common with the other members of the cooperative', 'Being a member of the cooperative is an important part of whom I am', and 'I feel attached to the other cooperative members'. One item was used to measure the evaluative component: 'I am proud to be part of the cooperative', and another one to measure affective commitment to the group: 'I like talking about the cooperative in the presence of others'. They were answered through a 5-point Likert scale, from 1 = 'completely disagree' to 5 = 'completely agree'. Together, the five items formed an internally consistent scale (Cronbach's alpha = 0.86). Third, in order to assess the role of peer effects and, especially, opinion leaders in triggering investments in the cooperative, respondents were asked to rate on a five-point scale (from 1 = 'not at all' to 5 = 'completely') the extent to which the influence or the advice of other members played a role in their decision to join the cooperative (*ADVICE*).

The environmental factors were captured by individuals' pro-environmental self-identity (*PROENVIDENT*) and the importance attached to the production of RE in their decision to join the cooperative (*RENEWABLE*). In order to measure the degree of pro-environmental self-identity, six items from existing questionnaires were selected and adapted (Castro et al., 2009; Fielding et al., 2008; Whitmarsh and O'Neill, 2010). These items measured on a five-point scale the extent to which the respondent perceived himself as a person concerned with environmental issues. The items were then aggregated into a single summative scale. Table 3 reports the specific statements for both social identity with the cooperative and pro-environmental self-identity, along with statistics to test for internal consistency (item-total correlations and Cronbach's alpha). In order to capture the importance attached to the production of RE when joining the organization, respondents were asked to report the degree to which they valued the production of RE in their decision to join the cooperative on a five-point scale (from 1 'not at all' to 5 'completely').

Regarding the institutional dimension, the importance attached to the democratic governance of the cooperative (*DEMOCRATIC*) was captured by asking participants to indicate on a five-point scale (from 1 'not at all' to 5 'completely') the extent to which they valued the democratic control of the organization (the "one person-one vote" rule) in their decision to join the cooperative.

Table 3
Item-total correlation and Cronbach's alpha for the different scales (sample of Ecopower members).
Source: survey (2014).

	Item-total correlation and Cronbach's alpha	Item-rest correlation
Social identification with the cooperative		
1. I am proud to be part of the cooperative.	0.77	0.64
2. I have a lot in common with the other members of the cooperative.	0.79	0.67
3. Being a member of the cooperative is an important part of who I am.	0.83	0.72
4. I feel attached to the other cooperative members.	0.82	0.70
5. I like talking about the cooperative in the presence of others.	0.79	0.65
Cronbach's alpha	0.86	
Pro-environmental self-identity		
1. I feel concerned about climate change.	0.80	0.69
2. I think that human activities are one of the main causes of climate change.	0.66	0.51
3. I am the type of person who cares about ecology.	0.79	0.71
4. I think of myself as an eco-responsible consumer.	0.76	0.65
5. I want to feel that I personally contribute to the protection of the environment.	0.82	0.73
6. I like that my family or my friends see me as someone concerned by the environment	0.76	0.60
Cronbach's alpha	0.85	

Table 4
Descriptive overview of the variables (sample of Ecopower members).
Source: survey (2014).

Variable	Description	N	Mean	SD
Dependent variable				
NUMBERSHARES	Ordinal variable indicating the category of the number of shares purchased (1–6)	3603	1.29	0.91
Explanatory variables				
ROI	Ordinal variable taking values from 1 to 5 and indicating the importance of the return on investment as a motivation to join the cooperative	3839	2.49	1.36
PRICE	Ordinal variable taking values from 1 to 5 and indicating the importance of the electricity price as a motivation to join the cooperative	3839	3.63	1.19
NETWORK	= 1 if member has other coop members in close social networks	3720	0.57	0.49
SOCIDENT	Ordinal variable taking values from 1 to 5 and indicating cooperative members' social identification with the cooperative	3839	3.21	0.89
ADVICE	Ordinal variable taking values from 1 to 5 and indicating the importance of the influence or the advice of other members as a motivation to join the cooperative	3839	2.24	1.30
PROENVIDENT	Ordinal variable taking values from 1 to 5 and indicating cooperative members' pro-environmental self-identity	3839	4.06	0.70
RENEWABLE	Ordinal variable taking values from 1 to 5 and indicating the importance of the production of renewable energy as a motivation to join the cooperative	3839	3.79	1.43
DEMOCRATIC	Ordinal variable taking values from 1 to 5 and indicating the importance of the democratic control of the organization as a motivation to join the cooperative	3839	3.17	1.41
Control variables				
EDUCATION	Ordinal variable taking the value 1 if secondary education, 2 if superior non-university education and 3 if university education	3682	2.05	0.77
AGE	Age in years	3825	49.12	11.95
GENDER	= 1 if individual is a man	3816	0.82	0.39
INCOME	Ordinal variable taking the value 1 if household income < 2000 €/month, 2 if 2000 €/month < household income < €4000/month and 3 if household income > €4000/month	3302	2.04	0.67
YEARS	Period of membership in years	3714	2.58	0.71
PAPER	= 1 if respondent participated to the paper survey	3839	0.02	0.15

Finally, data were also collected for basic socio-demographic characteristics: level of education, age, gender and level of income. In addition, respondents were asked about their period of membership, i.e. how many years they were part of their cooperative. Table 4 reports the description and summary statistics of all the variables used in the analysis for the sample of Ecopower members.

3.4. Data analysis

In a first step, the analysis was conducted for the sample of Ecopower members considered as a whole. A correlation analysis was conducted in order to gain a first insight on the bivariate associations between the dependent and independent variables. The Spearman's rank correlation coefficient was used, as the dependent variable and most of the independent variables used in the analysis were ordinal (Conover, 1999). Then, a multivariate analysis was carried out. An ordered probit model was used to predict the size investments (Wooldridge, 2002). Parameters were estimated by maximum

likelihood. The latent utility function of an individual was modelled as follows:

$$\begin{aligned}
 \text{NUMBERSHARES}_i = & \beta_1 \text{ROI}_i + \beta_2 \text{PRICE}_i + \beta_3 \text{NETWORK}_i + \beta_4 \text{ADVICE}_i \\
 & + \beta_5 \text{SOCIDENT}_i + \beta_6 \text{PROENVIDENT}_i + \beta_7 \text{RENEWABLE}_i \\
 & + \beta_8 \text{DEMOCRATIC}_i + \sum_{j=1}^n \beta_j X_{i,j} + u_i.
 \end{aligned} \tag{1}$$

where i denotes the individual. In this equation, the number of shares purchased was specified as a linear function of the economic, social, environmental and institutional factors described previously and a set of controls, $X_{i,j}$. Control variables are potential determinants of households' investments in energy technologies as often used in the literature, and include age, gender, education and income, as well as the period of membership. u_i is the error term.

In a second step, to explore potential differences among distinct profiles of cooperative members, the regression described in equation (1) was run in samples restricted to the two first cohorts (i.e. those who

Table 5

Correlation table (sample of Ecopower members).

Source: survey (2014). P-value: *p < .05; **p < .01

Spearman's rho	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. NUMBERSHARES														
2. ROI	0.28**													
3. PRICE	-0.06**	0.22**												
4. NETWORK	0.06**	0.06**	-0.05*											
5. SOCIDENT	0.06**	0.06**	-0.03	0.14**										
6. ADVICE	-0.04*	0.17**	0.06**	0.16**	0.26**									
7. PROENVIDENT	0.02	-0.09**	-0.15**	0.09**	0.44**	0.09**								
8. RENEWABLE	-0.01	-0.04*	-0.18**	0.06**	0.35**	0.09**	0.42**							
9. DEMOCRATIC	0.06**	0.12**	0.01	0.07**	0.44**	0.37**	0.22**	0.30**						
10. EDUCATION	0.01	-0.05**	-0.09**	0.05**	0.01	-0.10**	0.15**	0.12**	-0.08**					
11. AGE	0.21**	0.09**	0.03	-0.04*	0.08**	0.00	-0.02	-0.06**	0.15**	-0.27**				
12. GENDER	0.08**	0.10**	0.04*	-0.02	0.00	-0.02	-0.11**	-0.12**	0.02	-0.12**	0.10**			
13. INCOME	0.01	0.00	-0.06**	0.01	-0.05**	-0.09**	-0.03	-0.01	-0.11**	0.30**	-0.20**	0.13**		
14. YEARS	0.16**	0.03	-0.05**	0.08**	0.16**	-0.07**	0.14**	0.14**	0.06**	0.07**	0.17**	0.00	0.03	
15. PAPER	0.11**	0.05**	-0.02	0.02	0.07**	0.04	0.00	0.04	0.09**	0.00	0.10**	0.00	-0.05**	0.01

joined during the two first phases of the cooperative described in Section 3.1.)⁹ and to the third cohort of Ecopower members, respectively. This analysis was also carried out for the sample of BeauVent members.

4. Results and discussion

4.1. Correlation analysis

Table 5 presents the results of the Spearman's rank correlation analysis between the dependent variable and all the independent variables used in the analysis for the sample of Ecopower members. The importance attached to the return on investment (ROI) has the strongest (positive) relationship with the size of investments in the cooperative (NUMBERSHARES), while the importance of the electricity price is significantly negatively associated with the dependent variable. This indicates the pivotal, but contrasted role of economic incentives in triggering investments at the community level.

The presence of other members in close social networks and social identification with the cooperative are also positively associated with the size of investments, although to a lesser extent than the return on investment. The two indicators of the environmental dimension, pro-environmental self-identity (PROENVIDENT) and the importance attached to the production of RE (RENEWABLE), are not significantly correlated with the number of shares purchased. The importance attached to the democratic control of the organization (DEMOCRATIC) is positively associated with NUMBERSHARES, although the correlation coefficient is relatively small. While members' level of education and, perhaps more surprisingly, level of income are both uncorrelated with NUMBERSHARES, age and gender display a positive association with the dependent variable. In addition, the size of investments increases with the membership period (YEARS), reflecting that people who have been members for a longer period of time tend to have invested a higher amount of money. The variable PAPER is also positively correlated with the number of shares purchased, suggesting that the format of the survey influences the results. The high positive correlation ($r_s = 0.49$) between PAPER and DEMOCRATIC may be due to the fact that the paper version of the survey was handed out during a General Assembly. It seems likely that the people who participate in General Assemblies also place a high value on the democratic control of organizations, hence the positive correlation between PAPER and DEMOCRATIC.

⁹ These two cohorts were analyzed together, as the number of observations for the first cohort was too small to be analyzed separately.

4.2. Regression analysis

4.2.1. Ecopower members

Table 6 presents the results of the ordered probit analysis. Different specifications were estimated and control variables were added gradually. Model 1 presents the effects of the economic, social, environmental and institutional factors without any additional control variable. The largest effect is for the return on investment, which positively influences the number of shares purchased. This result suggests that financial contributions in the cooperative are largely driven by the expectation of an economic return. It also confirms in a multivariate and more robust setting Holstenkamp and Kahla (2016, 115)'s descriptive observation that "citizens who invest higher sums are more likely to do so in order to receive a return on investment".

The importance attached to a low electricity price has a significant negative effect. This indicates that members who joined the cooperative mainly for access to cheap electricity tend to invest smaller amounts of money. This is consistent with Bauwens (2016)'s results, which show that, when Ecopower started electricity supply to cooperative membership, it modified the incentive structure faced by existing and potential members and "started attracting members who were quite distinct from early members and who developed more of a customers' attitude in wanting to benefit from the advantages of electricity supply without investing large amounts of money in the cooperative" (Bauwens, 2016, 287).

Regarding social factors, having other cooperative members in one's close social networks increases the financial contributions to the cooperative. Similarly, social identification with the cooperative has a significant, but smaller, positive effect on the number of shares purchased. That is, the more cooperative members identify with their organization, the larger their investments. The importance of other members' influence or advice has a significant negative effect on the amount of money invested in the cooperative. This result can be interpreted in terms of Rogers (1995)'s analysis of opinion leadership and diffusion networks of innovations. In this perspective, if the cooperative management of RE projects is seen as an institutional innovation, early cooperative members, as early adopters of the innovation, have a higher degree of opinion leadership than later adopters (Rogers, 1995). By contrast, members for whom other members' influence or advice was an important motivation to join the cooperative tend to be opinion followers, seeking trusted information and advice from existing cooperative members. Thus, the negative coefficient of the importance attached to other members' influence or advice shows that opinion followers tend to make smaller financial contributions in the cooperative than opinion leaders.

Table 6

Determinants of the size of investments: Ecopower members.

Source: survey (2014). P-value: *p < .05; **p < .01.

	Model 1	Model 2	Model 3	Model 4
Explanatory variables				
ROI	0.40** (0.02)	0.39** (0.03)	0.39** (0.03)	0.40** (0.03)
PRICE	−0.18** (0.02)	−0.18** (0.03)	−0.18** (0.03)	−0.18** (0.03)
NETWORK	0.16** (0.06)	0.19** (0.06)	0.19** (0.06)	0.16* (0.06)
SOCIDENT	0.09* (0.04)	0.06 (0.04)	0.06 (0.04)	0.04 (0.04)
ADVICE	−0.15** (0.02)	−0.13** (0.03)	−0.13** (0.03)	−0.11** (0.03)
PROENVIDENT	0.05 (0.05)	0.08 (0.05)	0.06 (0.05)	0.05 (0.05)
RENEWABLE	−0.06* (0.02)	−0.02 (0.03)	−0.02 (0.03)	−0.03 (0.03)
DEMOCRATIC	0.08** (0.03)	0.03 (0.03)	0.04 (0.03)	0.04 (0.03)
Control variables				
AGE		0.03** (0.00)	0.03** (0.00)	0.03** (0.00)
GENDER		0.20* (0.09)	0.22* (0.09)	0.22* (0.09)
INCOME		0.11* (0.05)	0.07 (0.05)	0.07 (0.05)
EDUCATION			0.11** (0.04)	0.10* (0.04)
YEARS				0.20** (0.04)
N	2886	2886	2886	2886
McFadden's Pseudo- R ²	0.097	0.131	0.133	0.141
Log-likelihood	−1571.94	−1512.91	−1509.44	−1494.85

Table 7

Robustness analysis.

Source: survey (2014). P-value: *p < .05; **p < .01

	Adding the PAPER variable	Excluding members with membership period of less than 6 years	Probit model
Explanatory variables			
ROI	0.39** (0.03)	0.40** (0.03)	0.33** (0.02)
PRICE	−0.18** (0.03)	−0.18** (0.03)	−0.16** (0.02)
NETWORK	0.16* (0.06)	0.24** (0.07)	0.10 (0.06)
SOCIDENT	0.03 (0.04)	0.03 (0.05)	−0.03 (0.04)
ADVICE	−0.11** (0.03)	−0.13** (0.03)	−0.09** (0.03)
PROENVIDENT	0.06 (0.05)	0.00 (0.06)	0.06 (0.05)
RENEWABLE	−0.03 (0.03)	−0.03 (0.03)	−0.04 (0.03)
DEMOCRATIC	0.03 (0.03)	0.02 (0.03)	0.03 (0.03)
Control variables			
AGE	0.03** (0.00)	0.03** (0.00)	0.07 (0.04)
GENDER	0.23* (0.09)	0.13* (0.10)	0.02** (0.00)
INCOME	0.07 (0.05)	0.04 (0.05)	0.00 (0.08)
EDUCATION	0.09* (0.04)	0.07 (0.05)	0.10* (0.05)
YEARS	0.20** (0.04)	0.15** (0.05)	0.16** (0.04)
PAPER	0.62** (0.17)		
N	2886	1729	2996
McFadden's Pseudo- R ²	0.153	0.128	0.134
Log-likelihood	−1649.33	−1044.21	−1260.08

Regarding environmental factors, pro-environmental self-identity and the importance attached to the production of RE appear to have a negligible effect, suggesting that environmental factors do not play any major role in stimulating financial investments in the cooperative. This is all the more surprising since the importance attached to the production of RE emerged as the main motivation for joining the cooperative in a previous study (Bauwens, 2017a). As for the importance attached to the democratic control of the organization, its coefficient is significantly positive, suggesting that people strongly motivated by the democratic nature of cooperative governance tend to purchase more shares.

Model 2 introduces age, gender and income as socio-demographic controls. The most striking results are that the coefficients of *DEMOCRATIC* and *SOCIDENT* decrease and become statistically insignificant. The effects of these variables are not robust to the inclusion of the variable *AGE*, which is positively correlated with *NUMBERSHARES*, *DEMOCRATIC* and *SOCIDENT*, as shown in Table 5. Thus, the effects of *DEMOCRATIC* and *SOCIDENT* were overestimated due to the omission of this variable. *AGE* has a small, but significant positive effect across all specifications. This is in line with previous research. Sardanou and Genoudi (2013), for instance, find that middle-aged consumers are

more likely to invest in RE than younger people, probably because they are financially better-equipped to do so. Model 2 also shows that the level of investments in the cooperative increases with members' level of income. This finding indicates that increased revenue makes it easier to invest in CRE projects and is in line with previous studies showing a positive relation between income and the probability of investing in energy technologies (Long, 1993; Mills and Schleich, 2010; Sardanou and Genoudi, 2013; Ameli and Brandt, 2015).

Model 3 adds members' level of education, which has a significant positive effect. This result is consistent with much of previous empirical research showing that better-educated people are more likely to adopt energy efficient or renewable energy technologies (Mills and Schleich, 2009, 2012; Sardanou and Genoudi, 2013). The coefficient of *INCOME* decreases and becomes statistically insignificant. This suggests that part of the effect of income is mediated by the level of education. Other previous results are not changed by the inclusion of this variable.

Model 4 introduces the membership period and shows that, unsurprisingly, this variable positively affects the level of financial contributions to the cooperative. This controls for the fact that investments in the cooperative cumulated over time are larger for members who joined the cooperative earlier. The introduction of the membership

Table 8
Difference amongst members.

Source: survey (2014). P-value: *p < .05; **p < .01

Sample	Cohorts 1 and 2 of Ecopower members	Cohort 3 of Ecopower members	BeauVent
Explanatory variables			
ROI	0.33** (0.11)	0.40** (0.03)	0.25 (0.20)
PRICE	-0.30* (0.13)	-0.18** (0.03)	
NETWORK	0.72* (0.33)	0.17** (0.07)	0.93* (0.52)
SOCIDENT	0.01 (0.20)	-0.02 (0.05)	0.22 (0.34)
ADVICE	-0.02 (0.12)	-0.12** (0.03)	-0.36 (0.19)
PROENVIDENT	0.06 (0.13)	0.07 (0.06)	1.03* (0.44)
RENEWABLE	-0.02 (0.11)	-0.03 (0.03)	-0.31 (0.25)
DEMOCRATIC	-0.04 (0.13)	0.05 (0.03)	0.45* (0.22)
Control variables			
AGE	0.04** (0.02)	0.03** (0.00)	0.06** (0.02)
GENDER	0.84 (0.47)	0.24* (0.10)	1.61* (0.72)
INCOME	0.70** (0.24)	0.04 (0.05)	0.53 (0.33)
EDUCATION	0.27 (0.19)	0.06 (0.05)	-0.40 (0.30)
YEARS	-0.16 (0.20)	0.25** (0.05)	-0.15 (0.30)
N	112	2472	52
McFadden's Pseudo- R ²	0.193	0.138	0.216
Log-likelihood	-90.79	-3551.06	-45.98

period further reduces the effect of *SOCIDENT*. The coefficient of *NETWORK* also slightly decreases. Indeed, the membership period correlates positively with these two variables and with the dependent variable, as shown in [Table 5](#).

Additional analyses, which are presented in [Table 7](#), were conducted to assess the robustness of these results. In column 1, the variable *PAPER*, which indicates whether the respondent participated to the paper or the online version of the survey, was included as an additional control variable to check whether the mode of data collection influenced the results. Adding this variable does not affect the main results qualitatively.¹⁰ Another concern is the exit policy of Ecopower, which prevents members from selling their shares before six years of membership and, therefore, can distort the results. Yet, when the members who joined the cooperative less than six years preceding the survey (i.e. those who had not yet received the opportunity to trade their shares at the time of the survey) are withdrawn from the sample, similar results are obtained, as shown in column 2 of [Table 7](#). In a final robustness test, the dependent variable was transformed into a binary variable taking the value 1 if the respondent had purchased more than 10 shares and 0 otherwise. This was estimated with a Probit model (column 3). Overall the main results are confirmed.

4.2.2. Differences amongst members

To assess whether different results would be obtained for distinct groups of members, regressions with the most complete specification (model 4 in [Table 6](#)) were run in subsamples of Ecopower members and

¹⁰ The positive and statistically significant effect of this variable indicates that respondents who participated to the paper version of the survey tend to invest more in the cooperative. To interpret this result, recall that the hard copies of the questionnaire were handed out during a General Assembly of the cooperative. As the survey also included a question about the frequency of participation in General Assemblies, it can be shown that respondents who filled in the paper version participate in General Assemblies much more frequently than those who filled in the online version. Arguably, a frequent participation in annual General Assemblies is likely to be positively associated with higher investments: the fact of having invested higher amounts of money in the cooperative can make members feel more concerned with the financial situation of the organization and the way it is run and, therefore, more willing to have their say in General Assemblies. Conversely, a higher level of investment could result from a more active participation in decision-making. Due to this mutual causation and the resulting endogeneity issue, the frequency of participation in General Assemblies was not included in the analysis as an independent variable.

in the sample of BeauVent members. The results are presented in [Table 8](#).

First, regressions were run for samples restricted to the two first cohorts of Ecopower members and to the third cohort, respectively (columns 1 and 2). The results reveal interesting contrasts with the main analysis. Among the explanatory variables, *NETWORK* has the strongest (positive) effect on the dependent variable for the two first cohorts of members, while *ROI* has the largest effect in the case of the third cohort. This indicates that, while the results for later members are in line with the main analysis and show that the economic return dominates other factors, this does not hold for early members. In the latter case, the presence of other cooperative members in one's close social networks exhibits the largest effect. These contrasts can be related to the kind of communities formed by these groups of members: early Ecopower members form communities of place, while later Ecopower members represent a community of interest (see [Section 3.1](#)). Hence, these findings suggest that the higher level of social interactions triggered by spatial closeness act as a particularly strong driver for investments at the community level. Another noteworthy distinction is that the coefficient of *ADVICE* is small and insignificant for early Ecopower members, while it remains significantly negative for later members. This is consistent with the interpretation in terms of [Rogers \(1995\)](#)'s analysis of opinion leadership and diffusion networks of innovations presented above. Indeed, it confirms that other members' influence or advice does not play any role for early members, who are likely to have a higher degree of opinion leadership, while it does for later members, who may be expected to be opinion followers.

Second, the analysis was replicated in the other Flemish cooperative that was part of this study, BeauVent (column 3). The regression that was run for the sample of BeauVent members included all the explanatory variables except the importance of the electricity price. Indeed, as BeauVent is not an electricity retailer, this factor was irrelevant. Here, again, the findings differ from the main results in important ways. The effect of the return on investment is smaller and statistically insignificant, while pro-environmental self-identity and the importance attached to the democratic control of the organization have a relatively large and statistically significant positive effect. In addition, the effect of the presence of other cooperative members in one's close social networks is also very large and positive, similarly to early Ecopower members. As the spatial concentration of BeauVent members is also relatively high, these findings further reinforce the conclusion that social relationships especially and non-economic factors more generally are particularly strong drivers for investments in communities of place.

5. Conclusion and policy implications

The objective of this paper was to examine the economic, social, environmental and institutional determinants of the size of investments made by community renewable energy members. This study is, to the best of the author's knowledge, the first to analyze these factors jointly and, thereby, complements and extends existing studies which highlight a diversity of motivations among community energy members. The results reveal important distinctions. For later Ecopower members, economic incentives appear to play a major role: the return on investment is the strongest incentive to trigger larger financial contributions to the cooperative. Social factors play a secondary role and environmental and institutional factors do not seem to matter. By contrast, for early Ecopower members, the presence of other cooperative members in one's social networks emerges as the strongest factor. For BeauVent members, pro-environmental self-identity, the presence of other cooperative members in one's social networks and the importance attached to the democratic governance of the organization appear to have the strongest effects. Overall, this shows that the determinants of the size of investments depend on the kind of communities under scrutiny: in communities of place, environmental, social or other non-economic

considerations tend to dominate financial motives, while in communities of interest, economic factors are the primary drivers. The presence of other cooperative members in close social networks is a particularly strong factor in the former kind of communities, highlighting the importance of social interactions as a driver for investments.

Admittedly, this study has several limitations, which represent various viable avenues for further research. First, the findings are limited by the nature of the dependent variable. Indeed, while having used categories of levels of investments arguably contributed to improve the response rate to this question and to avoid biases from memory lapses, using the exact number of shares purchased would have provided more fine-grained statistical information. Notably, while an important distinction is likely to occur between members who have invested the smallest possible amount (one share) and those who bought more than what they have to in order to join the cooperative, these two groups cannot be separated as neatly. Second, different indicators of social interactions with other cooperative members could have been used, such as the number of members in social networks instead of the mere presence of members, the time spent with other members or the frequency of informal gatherings with other cooperative members. Third, it would be interesting to collect longitudinal data to assess whether investments and their determinants change over time, as cross-sectional data remain silent about it. Fourth, the possibility that some independent variables are endogenous cannot be ruled out with certainty. It is possible that some motivations might be affected by the fact of having invested. Further research could address this using an instrumental variable method, for example. Finally, the choices made in terms of geographical scope and in the sample frame imply some caution when generalizing the results. Further research could include the analysis of the determinants of citizen investments in other geographical contexts and in other forms of citizen investment vehicles for financing RE projects, such as crowdfunding platforms or shared ownership initiatives, which entail a legal relationship between a local community and a commercial developer.

In terms of policy and management implications, the findings of the present study can be used by project developers, policy makers and other stakeholders (including NGOs and representatives of local cooperatives and companies offering shares in CRE projects) to design effective measures to trigger financial investments at the community level. In particular, they can help develop more tailored approaches in project development and communication that target members with messages that most resonate with their audience. Members of large retail CRE organizations might be more likely to respond to the measures that emphasize an attractive economic return. Members of smaller communities of place might be more attracted to messages emphasizing the environmental and social benefits of CRE projects or the democratic governance of these organizations. The case of Ecopower demonstrates that segmentation of policy and management measures may be required even within the same CRE organization. The results also suggest that direct social interactions between cooperative members may contribute stimulating financial contributions, especially in communities of place. Project developers could therefore rely on this dimension by setting up a referral program and incentivizing existing members (with monetary incentives, but also possibly with social rewards, e.g. by providing the title of “cooperative champions” to particularly active members) to recommend investments in CRE initiatives to their friends, colleagues and relatives, thereby increasing word-of-mouth marketing.

More generally, there is also further potential for creating more favorable policy environments for CRE organizations. An important step in this direction was the recognition by the European Commission of the essential roles played by citizens and communities for advancing a low-carbon transition in the Energy Union package of 2016. However, concerns have also been raised about the recent evolutions toward an increasing reliance on competitive mechanisms, such as auctions, to support RE in various European countries. Indeed, these mechanisms have been feared to advantage larger companies while hindering citizen

investments, due to the complexity of application procedures and the higher level of risks entailed. A crucial policy recommendation would thus be to better accommodate the specificities of CRE projects in current support instruments. In Germany, for instance, where a shift from feed-in tariffs to auctions has recently taken place, an exemption clause was introduced in the first auction for onshore wind power in 2017 to protect CRE organizations. It seemed highly effective, as over 90% of the winning projects were cooperatives. Yet, scholars and commentators have casted doubts on the authenticity of the CRE projects winning the bids, suggesting that possible loopholes in the legal definition of CRE initiatives may allow large investors to misuse the offered exemption (Lundberg, 2019; Morris, 2017). This reflects the difficulties of combining citizen investments and auction systems. Solutions could be to exclude CRE projects from auctions altogether, or to better define who has access to the exemption clauses. The author of this paper firmly believes that community renewable energy is a promising model for advancing a just and socially acceptable low-carbon transition. However, careful analysis and critical discussion of members’ drivers, organizations’ strategies as well as policy instruments are needed to ensure a healthy balance between social, economic and environmental goals.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.enpol.2019.02.067>.

References

- Ameli, Nadia, Brandt, Nicola, 2015. ‘Determinants of Households’ Investment in Energy Efficiency and Renewables: Evidence from the OECD Survey on Household Environmental Behaviour and Attitudes’. *Environ. Res. Lett.* 10 (4), 044015. <https://doi.org/10.1088/1748-9326/10/4/044015>.
- Axsen, Jonn, Orlebar, Caroline, Stephen, Skippon, 2013. Social Influence and Consumer Preference Formation for Pro-Environmental Technology: The Case of a U.K. Workplace Electric-Vehicle Study. *Ecol. Econ.* 95 (0), 96–107. <https://doi.org/10.1016/j.ecolecon.2013.08.009>.
- Bamberg, Sebastian, Rees, Jonas, Seebauer, Sebastian, 2015. Collective Climate Action: Determinants of Participation Intention in Community-Based pro-Environmental Initiatives. *J. Environ. Psychol.* 43, 155–165. <https://doi.org/10.1016/j.jenvp.2015.06.006>.
- Barbarossa, Camilla, De Pelsmacker, Patrick, Moons, Ingrid, 2017. Personal Values, Green Self-Identity and Electric Car Adoption. *Ecol. Econ.* 140 (October), 190–200. <https://doi.org/10.1016/j.ecolecon.2017.05.015>.
- Bauwens, Thomas, 2016. Explaining the Diversity of Motivations behind Community Renewable Energy. *Energy Policy* 93, 278–290. <https://doi.org/10.1016/j.enpol.2016.03.017>.
- Bauwens, Thomas, 2017a. Designing Institutions for Collective Energy Action: The Roles of Renewable Energy Cooperatives in a Polycentric Low-Carbon Transition. Unpublished doctoral dissertation. University of Liège, Liège.
- Bauwens, Thomas, 2017b. Toward a Polycentric Low-Carbon Transition: The Roles of Community-Based Energy Initiatives in Enhancing the Resilience of Energy Systems. In: In: Labanca, Nicola (Ed.), *Complex Systems and Social Practices in Energy Transitions*, vols. 119–45 Springer, London.
- Bauwens, Thomas, Defourny, Jacques, 2017. Social Capital and Mutual Versus Public Benefit: The Case of Renewable Energy Cooperatives. *Ann. Public Coop. Econ.* 88 (2), 203–232. <https://doi.org/10.1111/apce.12166>.
- Bauwens, Thomas, Devine-Wright, Patrick, 2018. Positive Energies? An Empirical Study of Community Energy Participation and Attitudes to Renewable Energy. *Energy Policy* 118 (July), 612–625. <https://doi.org/10.1016/j.enpol.2018.03.062>.
- Bauwens, Thomas, Eyre, Nick, 2017. Exploring the Links between Community-Based Governance and Sustainable Energy Use: Quantitative Evidence from Flanders. *Ecol. Econ.* 137 (July), 163–172. <https://doi.org/10.1016/j.ecolecon.2017.03.006>.
- Bauwens, Thomas, Gotchev, Boris, Holstenkamp, Lars, 2016. What Drives the Development of Community Energy in Europe? The Case of Wind Power Cooperatives. In: *Energy Research & Social Science, Energy Transitions in Europe: Emerging Challenges, Innovative Approaches, and Possible Solutions*, vol. 13. pp. 136–147. March. <https://doi.org/10.1016/j.erss.2015.12.016>.
- Bauwens, Thomas, Benjamin Huybrechts, and Frédéric Dufays. Forthcoming. ‘Understanding the Diverse Scaling Strategies of Social Enterprises as Hybrid Organizations: The Case of Renewable Energy Cooperatives’. *Organization & Environment*, Forthcoming.
- Bergek, Anna, Mignon, Ingrid, Sundberg, Gunnel, 2013. Who Invests in Renewable Electricity Production? Empirical Evidence and Suggestions for Further Research. *Energy Policy* 56 (0), 568–581. <https://doi.org/10.1016/j.enpol.2013.01.038>.
- Berka, Anna L., Creamer, Emily, 2018. Taking Stock of the Local Impacts of Community Owned Renewable Energy: A Review and Research Agenda. *Renew. Sustain. Energy*

- Rev. 82 (February), 3400–3419. <https://doi.org/10.1016/j.rser.2017.10.050>.
- Bohnet, Iris, Frey, Bruno S., 1999. 'The Sound of Silence in Prisoner's Dilemma and Dictator Games'. *J. Econ. Behav. Organ.* 38 (1), 43–57. [https://doi.org/10.1016/S0167-2681\(98\)00121-8](https://doi.org/10.1016/S0167-2681(98)00121-8).
- Bollinger, Bryan, Gillingham, Kenneth, 2012. Peer Effects in the Diffusion of Solar Photovoltaic Panels. *Market. Sci.* 31 (6), 900–912. <https://doi.org/10.1287/mksc.1120.0727>.
- Bomberg, Elizabeth, McEwen, Nicola, 2012. 'Mobilizing Community Energy'. *Energy Policy*. *Renew. Energy China* 51 (December), 435–444. <https://doi.org/10.1016/j.enpol.2012.08.045>.
- Boon, Frank Pieter, Dieperink, Carel, 2014. Local Civil Society Based Renewable Energy Organisations in the Netherlands: Exploring the Factors That Stimulate Their Emergence and Development. *Energy Policy* 69, 297–307. <https://doi.org/10.1016/j.enpol.2014.01.046>.
- Bruni, Luigino, Stanca, Luca, 2008. Watching Alone: Relational Goods, Television and Happiness. *J. Econ. Behav. Organ.* 65 (3–4), 506–528. <https://doi.org/10.1016/j.jebo.2005.12.005>.
- Buchner, Barbara, Oliver, Pdraig, Wang, Xueying, Carswell, Cameron, Meattle, Chavi, Mazza, Federico, 2017. 'Global Landscape of Climate Finance 2017'. *Climate Policy Initiative*.
- Campbell, John Y., 2006. Household Finance. *J. Finance* 61 (4), 1553–1604. <https://doi.org/10.1111/j.1540-6261.2006.00883.x>.
- Castro, Paula, Garrido, Margarida, Reis, Elizabeth, Menezes, João, 2009. Ambivalence and Conservation Behaviour: An Exploratory Study on the Recycling of Metal Cans. *J. Environ. Psychol.* 29 (1), 24–33. <https://doi.org/10.1016/j.jenvp.2008.11.003>.
- Chen, Kee Kuo, 2014. Assessing the Effects of Customer Innovativeness, Environmental Value and Ecological Lifestyles on Residential Solar Power Systems Install Intention. *Energy Policy* 67 (April), 951–961. <https://doi.org/10.1016/j.enpol.2013.12.005>.
- Conover, W.J., 1999. *Practical Nonparametric Statistics*, third ed. John Wiley & Sons, Inc, New York.
- Dal, Bó, Pedro, Andrew Foster, Putterman, Louis, 2010. Institutions and Behavior: Experimental Evidence on the Effects of Democracy. *Am. Econ. Rev.* 100 (5), 2205–2229. <https://doi.org/10.1257/aer.100.5.2205>.
- Dawes, Robyn M., Van De Kragt, Alphons J.C., Orbell, John M., 1988. Not Me or Thee but We: The Importance of Group Identity in Eliciting Cooperation in Dilemma Situations: Experimental Manipulations. *Acta Psychol.* 68 (1–3), 83–97. [https://doi.org/10.1016/0001-6918\(88\)90047-9](https://doi.org/10.1016/0001-6918(88)90047-9).
- Dóci, Gabriella, Vasileiadou, Eleftheria, 2015. "Let's Do It Ourselves" Individual Motivations for Investing in Renewables at Community Level'. *Renew. Sustain. Energy Rev.* 49 (September), 41–50. <https://doi.org/10.1016/j.rser.2015.04.051>.
- Ebers Broughel, Anna, Hampl, Nina, 2018. Community Financing of Renewable Energy Projects in Austria and Switzerland: Profiles of Potential Investors. *Energy Policy* 123 (December), 722–736. <https://doi.org/10.1016/j.enpol.2018.08.054>.
- Ecopower, 2013. *Informatiedocument 2013*. Berchem: Ecopower.
- Ellemers, Naomi, Kortekaas, Paulien, Ouwerkerk, Jaap W., 1999. Self-Categorisation, Commitment to the Group and Group Self-Esteem as Related but Distinct Aspects of Social Identity. *Eur. J. Soc. Psychol.* 29 (2–3), 371–389. [https://doi.org/10.1002/\(SICI\)1099-0992\(199903/05\)29:2/3 < 371::AID-EJSP932 > 3.0.CO;2-U](https://doi.org/10.1002/(SICI)1099-0992(199903/05)29:2/3 < 371::AID-EJSP932 > 3.0.CO;2-U).
- Enzensberger, N., Fichtner, W., Rentz, O., 2003. 'Financing Renewable Energy Projects via Closed-End Funds—a German Case Study'. *Renew. Energy* 28 (13), 2023–2036. [https://doi.org/10.1016/S0960-1481\(03\)00080-6](https://doi.org/10.1016/S0960-1481(03)00080-6).
- Fielding, Kelly S., McDonald, Rachel, Louis, Winnifred R., 2008. Theory of Planned Behaviour, Identity and Intentions to Engage in Environmental Activism. *J. Environ. Psychol.* 28 (4), 318–326. <https://doi.org/10.1016/j.jenvp.2008.03.003>.
- Fleiß, Eva, Hatzl, Stefanie, Seebauer, Sebastian, Posch, Alfred, 2017. Money, Not Morale: The Impact of Desires and Beliefs on Private Investment in Photovoltaic Citizen Participation Initiatives. *J. Clean. Prod.* 141 (January), 920–927. <https://doi.org/10.1016/j.jclepro.2016.09.123>.
- Frohlich, Norman, Oppenheimer, Joe, 1998. Some Consequences of E-Mail vs. Face-to-Face Communication in Experiment. *J. Econ. Behav. Organ.* 35 (3), 389–403. [https://doi.org/10.1016/S0167-2681\(98\)00044-4](https://doi.org/10.1016/S0167-2681(98)00044-4).
- Gadenne, David, Sharma, Bishnu, Kerr, Don, Smith, Tim, 2011. 'The Influence of Consumers' Environmental Beliefs and Attitudes on Energy Saving Behaviours'. *Energy Policy* 39 (12), 7684–7694. <https://doi.org/10.1016/j.enpol.2011.09.002>.
- Gamel, Johannes, Menrad, Klaus, Decker, Thomas, 2016. 'Is It Really All about the Return on Investment? Exploring Private Wind Energy Investors' Preferences'. *Energy Res. Soc. Sci.* 14 (April), 22–32. <https://doi.org/10.1016/j.erss.2016.01.004>.
- Gross, Catherine, 2007. Community Perspectives of Wind Energy in Australia: The Application of a Justice and Community Fairness Framework to Increase Social Acceptance. *Energy Policy* 35 (5), 2727–2736. <https://doi.org/10.1016/j.enpol.2006.12.013>.
- Gui, Benedetto, 1996. 'On "Relational Goods": Strategic Implications of Investment in Relationships'. *Int. J. Soc. Econ.* 23 (10/11), 260–278. <https://doi.org/10.1108/03068299610149589>.
- Gui, Benedetto, 2000. Beyond Transactions: On the Interpersonal Dimension of Economic Reality. *Ann. Public Coop. Econ.* 71 (2), 139–169. <https://doi.org/10.1111/1467-8292.00138>.
- Guiso, Luigi, Sodini, Paolo, 2013. Household Finance: An Emerging Field. In: *Handbook of the Economics of Finance*, vol. 2. Elsevier, pp. 1397–1532. <https://doi.org/10.1016/B978-0-44-459406-8.00021-4>.
- Hicks, Jarra, Ison, Nicola, 2018. 'An Exploration of the Boundaries of "Community" in Community Renewable Energy Projects: Navigating between Motivations and Context'. *Energy Policy* 113 (February), 523–534. <https://doi.org/10.1016/j.enpol.2017.10.031>.
- Holstenkamp, Lars, Kahla, Franziska, 2016. What Are Community Energy Companies Trying to Accomplish? An Empirical Investigation of Investment Motives in the German Case. *Energy Policy* 97 (Suppl. C), 112–122. <https://doi.org/10.1016/j.enpol.2016.07.010>.
- Huybrechts, Benjamin, Mertens, Sybille, 2014. The Relevance Of The Cooperative Model In The Field Of Renewable Energy. *Ann. Public Coop. Econ.* 85 (2), 193–212. <https://doi.org/10.1111/apce.12038>.
- IRENA Coalition for Action, 2018. *Community Energy: Broadening The Ownership of Renewables*. IRENA Coalition for Action.
- Kalkbrenner, Bernhard J., Roosen, Jutta, 2016. 'Citizens' Willingness to Participate in Local Renewable Energy Projects: The Role of Community and Trust in Germany'. In: *Energy Research & Social Science*, Energy Transitions in Europe: Emerging Challenges, Innovative Approaches, and Possible Solutions, vol. 13. pp. 60–70. March. <https://doi.org/10.1016/j.erss.2015.12.006>.
- Knoefel, Jan, Sagebiel, Julian, Yildiz, Özgür, Müller, Jakob R., Rommel, Jens, 2018. A Consumer Perspective on Corporate Governance in the Energy Transition: Evidence from a Discrete Choice Experiment in Germany. *Energy Econ.* 75 (September), 440–448. <https://doi.org/10.1016/j.eneco.2018.08.025>.
- Koirala, Binod Prasad, Araghi, Yashar, Kroesen, Maarten, Ghorbani, Amineh, Hakvoort, Rudi A., Herder, Paulien M., 2018. Trust, Awareness, and Independence: Insights from a Socio-Psychological Factor Analysis of Citizen Knowledge and Participation in Community Energy Systems. *Energy Res. Soc. Sci.* 38 (April), 33–40. <https://doi.org/10.1016/j.erss.2018.01.009>.
- Ledyard, John O., 1995. Public Goods: A Survey of Experimental Research. In: In: Kagel, John H., Roth, Alvin E. (Eds.), *The Handbook of Experimental Economics*, vols. 111–94 Princeton University Press, Princeton. <http://search.ebscohost.com/login.aspx?direct=true&db=ecn&AN=0453736&site=ehost-live>.
- Litvine, Dorian, Wüstenhagen, Rolf, 2011. 'Helping "Light Green" Consumers Walk the Talk: Results of a Behavioural Intervention Survey in the Swiss Electricity Market'. *Ecol. Econ.* 70 (3), 462–474. <https://doi.org/10.1016/j.ecolecon.2010.10.005>.
- Long, James E., 1993. An Econometric Analysis of Residential Expenditures on Energy Conservation and Renewable Energy Sources. *Energy Econ.* 15 (4), 232–238. [https://doi.org/10.1016/0140-9883\(93\)90012-G](https://doi.org/10.1016/0140-9883(93)90012-G).
- Lundberg, Liv, 2019. Auctions for All? Reviewing the German Wind Power Auctions in 2017. *Energy Policy* 128 (May), 449–458. <https://doi.org/10.1016/j.enpol.2019.01.024>.
- Maruyama, Yasushi, Nishikido, Makoto, Iida, Tetsunari, 2007. The Rise of Community Wind Power in Japan: Enhanced Acceptance through Social Innovation. *Energy Policy* 35 (5), 2761–2769. <https://doi.org/10.1016/j.enpol.2006.12.010>.
- Masini, Andrea, Menichetti, Emanuela, 2012. The Impact of Behavioural Factors in the Renewable Energy Investment Decision Making Process: Conceptual Framework and Empirical Findings. *Energy Policy* 40, 28–38. <https://doi.org/10.1016/j.enpol.2010.06.062>.
- Masini, Andrea, Menichetti, Emanuela, 2013. 'Investment Decisions in the Renewable Energy Sector: An Analysis of Non-Financial Drivers'. *Technological Forecasting and Social Change*. *Futur. Oriented Technol. Anal.* 80 (3), 510–524. <https://doi.org/10.1016/j.techfore.2012.08.003>.
- McLaren Loring, Joyce, 2007. Wind Energy Planning in England, Wales and Denmark: Factors Influencing Project Success. *Energy Policy* 35 (4), 2648–2660. <https://doi.org/10.1016/j.enpol.2006.10.008>.
- Mills, Bradford F., Schleich, Joachim, 2009. 'Profits or Preferences? Assessing the Adoption of Residential Solar Thermal Technologies'. *Energy Policy*, Carbon in Motion: Fuel Economy, Vehicle Use, and Other Factors affecting CO2 Emissions From. *Transport* 37 (10), 4145–4154. <https://doi.org/10.1016/j.enpol.2009.05.014>.
- Mills, Bradford F., Schleich, Joachim, 2010. 'Why Don't Households See the Light?: Explaining the Diffusion of Compact Fluorescent Lamps'. *Resour. Energy Econ.* 32 (3), 363–378. <https://doi.org/10.1016/j.reseneeco.2009.10.002>.
- Mills, Bradford F., Schleich, Joachim, 2012. 'Residential Energy-Efficient Technology Adoption, Energy Conservation, Knowledge, and Attitudes: An Analysis of European Countries'. *Energy Policy*, Special Section: Fuel Poverty Comes of Age. Commemorating 21 Years of Research and Policy 49 (October), 616–628. <https://doi.org/10.1016/j.enpol.2012.07.008>.
- Morris, Craig, 2017. 'Wind Power Hit Record Low Price in German Auctions. Few Are Happy'. *Energy Transition* (blog). 22 August 2017. <https://energytransition.org/2017/08/wind-power-hit-record-low-price-in-german-auctions-few-are-happy/>.
- Musall, F.D., Kuik, O., 2011. Local Acceptance of Renewable Energy - a Case Study from Southeast Germany. *Energy Policy* 39 (6), 3252–3260.
- Nilsson, Jonas, 2008. Investment with a Conscience: Examining the Impact of Pro-Social Attitudes and Perceived Financial Performance on Socially Responsible Investment Behavior. *J. Bus. Ethics* 83 (2), 307–325. <https://doi.org/10.1007/s10551-007-9621-z>.
- Radtke, Jörg, 2014. A Closer Look inside Collaborative Action: Civic Engagement and Participation in Community Energy Initiatives. *People, Place and Policy* 8 (3), 235–248.
- Rogers, Everett M., 1995. *Diffusion of Innovations*. Free Press, New York.
- Rogers, J., Simmons, E., Convery, L., Weatherall, A., 2008. Public Perceptions of Opportunities for Community-Based Renewable Energy Projects. *Energy Policy* 36, 4217–4226.
- Salm, Sarah, Lena Hille, Stefanie, Rolf, Wüstenhagen, 2016. 'What Are Retail Investors' Risk-Return Preferences towards Renewable Energy Projects? A Choice Experiment in Germany'. *Energy Policy* 97 (October), 310–320. <https://doi.org/10.1016/j.enpol.2016.07.042>.
- Sardianou, E., Genoudi, P., 2013. Which Factors Affect the Willingness of Consumers to Adopt Renewable Energy? *Renew. Energy* 57 (September), 1–4. <https://doi.org/10.1016/j.renene.2013.01.031>.
- Schreuer, Anna, 2012. WP3 REPORT: Collective Citizen Ownership of Green Electricity Plants, Country Case Studies Austria and Germany. In: *Research Report*. Graz: Inter - University Research Centre for Technology, Work and Culture (IFZ).

- Sparks, Paul, Shepherd, Richard, 1992. 'Self-Identity and the Theory of Planned Behavior: Assessing the Role of Identification with "Green Consumerism"'. *Soc. Psychol. Q.* 55 (4), 388–399. <https://doi.org/10.2307/2786955>.
- Stürmer, Stefan, Kampmeier, Claudia, 2003. Active Citizenship: The Role of Community Identification in Community Volunteerism and Local Participation. *Psychol. Belg.* 43 (1–2), 103–122.
- Tajfel, H., 1978. Social Categorization, Social Identity and Social Comparison. In: Tajfel, H. (Ed.), *Differentiation between Social Groups: Studies in the Social Psychology of Intergroup Relations*. Academic Press, London, pp. 61–76.
- Tyler, Tom R., Blader, Steven L., 2001. Identity and Cooperative Behavior in Groups. *Group Process. Intergr. Relat.* 4 (3), 207–226. <https://doi.org/10.1177/1368430201004003003>.
- Uhlener, Carole Jean, 1989. "Relational Goods" and Participation: Incorporating Sociability into a Theory of Rational Action'. *Publ. Choice* 62 (3), 253–285.
- Walker, G., 2008. What Are the Barriers and Incentives for Community-Owned Means of Energy Production and Use? *Energy Policy* 36 (12), 4401–4405.
- Walker, Gordon, 2011. 'The Role for "Community" in Carbon Governance'. *Wiley Interdisciplinary Reviews: Clim. Change* 2 (5), 777–782. <https://doi.org/10.1002/wcc.137>.
- Walker, Gordon, Devine-Wright, Patrick, 2008. Community Renewable Energy: What Should It Mean? *Energy Policy* 36 (2), 497–500. <https://doi.org/10.1016/j.enpol.2007.10.019>.
- Walker, Gordon, Devine-Wright, Patrick, Hunter, Sue, High, Helen, Evans, Bob, 2010. Trust and Community: Exploring the Meanings, Contexts and Dynamics of Community Renewable Energy. *Energy Policy* 38 (6), 2655–2663. <https://doi.org/10.1016/j.enpol.2009.05.055>.
- Warren, Charles R., McFadyen, Malcolm, 2010. Does Community Ownership Affect Public Attitudes to Wind Energy? A Case Study from South-West Scotland. *Land Use Pol.* 27 (2), 204–213. <https://doi.org/10.1016/j.landusepol.2008.12.010>.
- Whitmarsh, Lorraine, O'Neill, Saffron, 2010. Green Identity, Green Living? The Role of pro-Environmental Self-Identity in Determining Consistency across Diverse pro-Environmental Behaviours. *J. Environ. Psychol.* 30 (3), 305–314. <https://doi.org/10.1016/j.jenvp.2010.01.003>.
- Wizelius, Tore, 2014. *Windpower Ownership in Sweden: Business Models and Motives*. Routledge.
- Wooldridge, Jeffrey, 2002. *Econometric Analysis of Cross Section and Panel Data*. MIT Press, Cambridge, MA. <http://www.amazon.ca/exec/obidos/redirect?tag=citeulike09-20&path=ASIN/0262232197>.
- Wüstenhagen, R., Menichetti, E., 2012. Strategic choices for renewable energy investment: Conceptual framework and opportunities for further research. *Energy Policy* 40, 1–10. <https://doi.org/10.1016/j.enpol.2011.06.050>.
- Yıldız, Özgür, 2014. 'Financing Renewable Energy Infrastructures via Financial Citizen Participation – The Case of Germany'. *Renew. Energy* 68 (0), 677–685. <https://doi.org/10.1016/j.renene.2014.02.038>.
- Yıldız, Özgür, Rommel, Jens, Debor, Sarah, Holstenkamp, Lars, Mey, Franziska, Müller, Jakob R., Radtke, Jörg, Rognli, Judith, 2015. Renewable Energy Cooperatives as Gatekeepers or Facilitators? Recent Developments in Germany and a Multidisciplinary Research Agenda. *Energy Res. Soc. Sci.* 6 (0), 59–73. <https://doi.org/10.1016/j.erss.2014.12.001>.