



## Original research article

## For the climate, my friends, or my region? An experimental field trial for prosumer engagement with peer-to-peer energy trading in Austria

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## ABSTRACT

Collective, citizen-led approaches to energy systems are key to reducing humanity's climate impact. Crucial for their success is the engagement of energy prosumers, i.e., citizens that produce energy. This paper investigates how to best activate the identities of prosumers to participate in peer-to-peer energy trading. In collaboration with the OurPower cooperative in Austria, an experimental trial was set up: 8713 households equipped with photovoltaic systems were randomly selected to receive one of three postcards. Postcards appealed to different identities, using as slogan "your *climate*. your electricity" or "your *friends*. your electricity" or "your *region*. your electricity". The postcards were designed to encourage prosumers to visit the OurPower webpage and register via a link and QR code to trade their energy. For our main dependent variable, the unique webpage visits, we recorded a 3.1 % response rate ( $N = 271$  visitors out of 8713 recipients) and found that while the social identity framings (region and peer-group) did not significantly differ in response rates, they both outperformed the individual climate identity framing. For click-through to express more interest ( $N = 73$  out of 271 visitors), the region framing was more successful than the peer-group framing, but not the climate framing. For length of stay on the website ( $N = 145$  visitors), regional framing ( $M_r = 73.5$  s) held an advantage over the other two ( $M_{climate} = 22.9$  s;  $M_{friends} = 17.5$  s). Together, the results demonstrate that putting regional focus into the spotlight could be a promising consideration for future energy-related campaigns and interventions.

## 1. Introduction

Small-scale renewable electricity production is continually increasing, so its integration into the grid requires the development of new models for allocation [1]. Peer-to-peer energy trading (P2P) is one such model. It proposes that sellers can generate their own energy in dwellings, offices and factories, and share it with each other locally – either as a form of microgeneration matching supplier and consumer on a minute-by-minute basis, or in the form of a longer-term commitment to a single supplier in the region [2–4]. One of its major advantages is the focus on localized exchange. This can increase network efficiency and energy security, and reduce pollution [5], so it is currently considered a highly viable solution to both climate and grid issues [6]. Yet, the gains hinge on the sourcing of enough providers to improve the virtual matching of supply and demand [7].

P2P energy trading has been discussed in the literature as a form of

collective energy action, i.e. as one potential way to engage citizens in a collective or community based manner [8,9]. P2P environments have directly been called "communities" [10], though the definition of "community" in the energy context has recently been under scrutiny, as it has been found to vary substantially across contexts [11]. Still, the collective component of P2P trading has been stressed, as it depicts a potential way to allow communities (including friends and neighbours) to come together to co-participate in a pro-environmental behavior [8,12]. Further highlighting the collective aspect, P2P energy trading in Europe often goes along with participation in energy cooperatives (ECs) [13]. An example is the Austrian energy cooperative OurPower, which provides the setting for the current study, offers P2P trading as one of its main products. We consider the engagement with such P2P trading ECs as participation in a collective energy action.

The success of P2P energy trading networks hinges on citizens joining and contributing energy from their renewable energy

**Abbreviations:** P2P, peer-to-peer; PV, photovoltaic; EC, energy cooperative.

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infrastructure, for example from photovoltaic (PV) installations. Those citizens are commonly known as “prosumers”, agents that both produce and consume electricity [1] and are “proactive consumers with distributed energy resources actively managing their consumption, production and storage of energy” [5].

Little evidence exists on the best practices for membership procurement of ECs in general and how to best activate potential prosumers to consider P2P trading within ECs in particular [14,15]. To the best of our knowledge, no experimental field research to this end exists. To fill this gap, we designed an experimental study together with the energy cooperative OurPower. We used three different promotional communications (postcards using slogans of “your climate. your electricity”, “your region. your electricity”, “your friends. your electricity”) to engage existing electricity prosumers to visit OurPower’s webpage, and potentially become P2P providers, in this case by joining the cooperative.

Following Sovacool’s [16] code of practice for appropriate research design, our research objective is thus to investigate the effect of different identity-targeting frames on engagement of prosumers towards an energy cooperative’s P2P energy trading. The primary contribution of our research is empirical and concerns the application of identity theory to the context of prosumer engagement. We gather new evidence targeting which identities work best in this context, within a positivist paradigm using quantitative experimental methodology, though we caution that external validity might be low due to the relatively small, highly selective sample of prosumers solely from Upper Austria, and a lack of pretesting of our postcard materials.

In what follows, we will first review evidence regarding identity framings that have been previously used to activate participation in collective environmental actions in general and then investigate factors that predict participation in ECs generally, and P2P in particular. Then we will outline the field experiment, and report and discuss the results.

### 1.1. Activating identities for participation in collective environmental actions

In this section, we want to cover identity factors that have been shown to correlate with or predict participation of end users in environmental and collective environmental actions. Participation can be defined as any behavior that indicates involvement with the collective pro-environmental action, including, but not limited to, joining protests or clean-ups, becoming a member of energy cooperatives or communities, collectively investing in resources such as PVs or green tariffs, or purchasing electricity from an EC or its representatives.

Individuals’ various identities, i.e. personal as well as group-based identities, are considered of high importance in the environmental psychology literature (for an overview, see [17]). Beliefs based on personal identities, such as effectiveness or cost-benefit beliefs, might lead to pro-environmental action, for example described by the Theory of Planned Behavior [18] and related models [19].

Environmental identity, mostly operationalized via constructs such as nature connectedness and relatedness, and environmental friendliness, is one of the most commonly identified aspects of personal identity that enables pro-environmental behavior [20–24], such as becoming a sustainable energy prosumer [25–27].

Beyond this individualized focus, theorizing has recently been extended to integrate the human capacity to consider oneself as a member of different groups [28,29]. Such a focus seems necessary in the genuinely collective setting of energy cooperatives. Social identities, which can be habitually strong or situationally induced by salient cues or the presence of other group members, activate and guide attitudes and behavior by providing beliefs and norms [30–32].

The connection between in-group identification and pro-environmental behavior has been drawn in the social identity model of collective action [33] and the social identity model of pro-environmental action [34]. The strength of identification with

different social groups, such as climate protection initiatives, political groups, humanity as a whole, families or neighbourhoods, routinely predicts participation in collective pro-environmental actions [33,35–38]. Situational triggers of social identities that predict collective pro-environmental actions include reminders of political identities, which have been shown to affect climate change appraisals of members of different political alignments [39], of student group membership, which increased intention to save water [40] and of one’s general in-group memberships, which increased intention to show pro-environmental behavior [41]. Across these examples, the strength of social identities even drove pro-environmental actions for groups without explicitly pro-environmental goals. It thus seems worthwhile to study various social identities (e.g., highlighting connectedness with friends) in trying to improve engagement and interest in genuinely pro-environmental groups, such as ECs.

Finally, for actions around energy production, an important social identity might be one defined by proximity to the place of residence. Place identity has long been researched as “individuals’ incorporation of places into the larger concept of self” [42], usually referring to their place of residence or origin. A social component has also recently been introduced to the conceptualization (for a review, see [43]). Place identification of citizens has predicted stronger environmental attitudes and behaviors [44] and inducing and identifying local identity salience and regional pride has predicted environmental protection behaviors [45,46]. The framing in terms regional residence has been shown to have positive effects on accepting scientific recommendations regarding water recycling [47]. An increase in willingness to pay was found for regional electricity for a community with a strong regional identity [48], and finally, feeling connection to one’s region and regional product beliefs has affected choices made for electricity contracts [49–51]. Activating or strengthening regional (social) identities could therefore also increase prosumers’ interest in P2P energy trading in the context of energy cooperatives, though a recently published study did not find a relationship between regional identity and higher willingness to pay for regional electricity [52], so more evidence is necessary to clarify this link.

### 1.2. Motivators for participation in energy cooperatives and P2P energy trading

Due to the large variance of ECs in terms of their members, size and complexity, identifying factors that encourage participation and engagement in ECs is challenging [53,54]. Existing case studies can be divided into those studying prospective EC members’ intention to join, and those surveying existing EC members about their successful operation. In a survey study in Belgium, subjective norms and perceived behavioral control as well as environmental and financial factors were all reported as predictors of intent to join an EC, with the strongest predictor being family, friends and neighbours’ opinion of EC participation [55]. Survey studies in Germany found social norms and trust [56] as well as favorable return, environmental values, peer expectations, prior experience and trust [57] to be important. The best predictor for intention to invest in community owned energy in an Australian sample was belief related to community benefits [58]. Surveying members of existing ECs, a study in Germany yielded ecological reasons to be the major motive for joining, with return on investment secondary [53]. Similarly, an econometric analysis of survey data as well as case studies in Netherlands marked all three, financial (for large supra-regional energy communities), as well as ecological and social factors (regional communities) as important [59–61]. In Scotland, qualitative research showed that shared identity was highly effective in mobilizing individuals, while structural resources could be a hindrance or help depending on constraint mitigation [62]. Finally, in an overview over case studies in the United States, the authors stated that neighbourly appeals and personal contact infrastructure were the building blocks of EC recruitment [63].

The challenge in motivating citizens to join P2P energy trading schemes is a dearth of rigorous evidence. While many studies on technical feasibility and market design exist [4], few studies have been conducted investigating factors that encourage participation [13,14]. Further generalization might be difficult due to the specialized knowledge and novelty of the technology mostly appealing to early adopters. The studies that exist are cross-sectional surveys, conjoint analyses, and case studies from mostly central Europe. While they agree on the main motivations, they differ in their prioritization [64]. Motivators have been found to be financial [12–14,48,64,65], community and sharing motives [13,14,65,66], sustainability and reducing emissions [14,65–67], and a desire for autarky and decentralization [12,65,68], including the state of charge of the own system [64]. Additional factors such as the regionality of the electricity, and data privacy [48], as well as more flexibility and learning motives [14,65,66] have been uncovered.

While the above research helps to better understand motivators to participate in ECs and P2P energy trading in general, the target group of the current study, existing prosumers, is a very specific, preselected subgroup [69]. In terms of finances, PV owners tend to be home owners of a higher socio-economic status [70,71]. They also have prior experience with the economic gains of PVs. Informational campaigns about financial gains therefore seem less promising. Further, prosumers have already invested in a PV installation, which reflects their strong pro-environmental identity [72]. A climate-related identity therefore represents a conservative baseline condition in the current setting, rather than a promising framing resulting in additional motivation.

In summary, most research so far conducted on how to motivate individuals to participate in ECs and P2P show that environmental and financial factors play a role. A subset of these studies, especially, for EC engagement, put a focus on the symbolic, regional and social aspects. However, it is important to note that no rigorous evidence stemming from longitudinal or experimental research seems to exist, which could inform concrete measures to incentivize engagement with and joining of an EC that offers P2P trading.

### 1.3. Research question

We carried out a field experiment to address the question of activating identities and investigate whether they could be leveraged to incentivize existing energy prosumers to participate in an energy cooperative in a P2P energy trading system. Specifically, we targeted PV owning prosumers, and tried to uncover how targeting their personal climate-related identity, or their peer-group or regional social identities would affect their behavior. Our dependent variable was engagement with the web presence of the OurPower energy cooperative. As a baseline, we chose the climate identity framing condition, highlighting climate contribution. Additionally, we designed a peer-group social framing condition, highlighting collaboration with friends, and a regional framing condition, highlighting individuals' potential contribution to value generated in their spatial-geographic proximity.

We investigated the following hypothesis: both regional and peer-group framing postcards will yield a higher engagement in terms of visits to the OurPower website as compared to the climate-related framing.

Exploratively, we investigated whether there would be a difference between the three conditions with regards to participants' engagement time with the website. We also exploratively investigated whether participants in any of the postcard conditions would be more likely to intend to actually join the energy cooperative and click-through to sell.

## 2. Methodology

### 2.1. Study design

The experimental study was conducted in collaboration with OurPower, a small energy cooperative operating in Austria. OurPower was

founded in October 2018 by 19 energy activists and experts, and as of November 2022 is comprised of 656 members. Members enter the cooperative by purchasing shares at a minimum of 100€. Aside from supporting investments in renewable energy infrastructure, OurPower offers as its main product a P2P marketplace to virtually match electricity consumers with specific prosumers offering their PV electricity production; it claims to be the first such platform where consumers can individually select their providers. As such, OurPower needs to recruit both, energy providers, e.g., households with solar panels as well as energy consumers to match effectively. Membership is required to participate in the P2P marketplace.

For the current study, OurPower contacted potential energy providers ("participants") by sending out postcards to existing addresses known to be equipped with PV systems ( $N = 8713$ ). These postcards included a link to the website and a small text with information<sup>1</sup> about the possibility to sell electricity and to become part of the energy cooperative (see Fig. 1). Most importantly, three different postcards were designed, each with a different postcard image (see Fig. 2) and a different text, targeting three forms of identity: the regional framing (your region. your electricity.); the peer-group framing (your friends. your electricity.); and the climate framing (your climate. your electricity.). While we had control over the text on the postcards, images were chosen by OurPower's marketing department, and no pilot testing of the material was conducted at this stage due to time limitations.

Participants were randomly assigned to one of the three groups to receive one of the three available postcard designs. Thus, the study consisted of a single factor design with three treatments, exploring which of the three targeted identities would lead to highest visits to the webpage, highest click-through rate to the sales webpage, and the most time spent on the site.

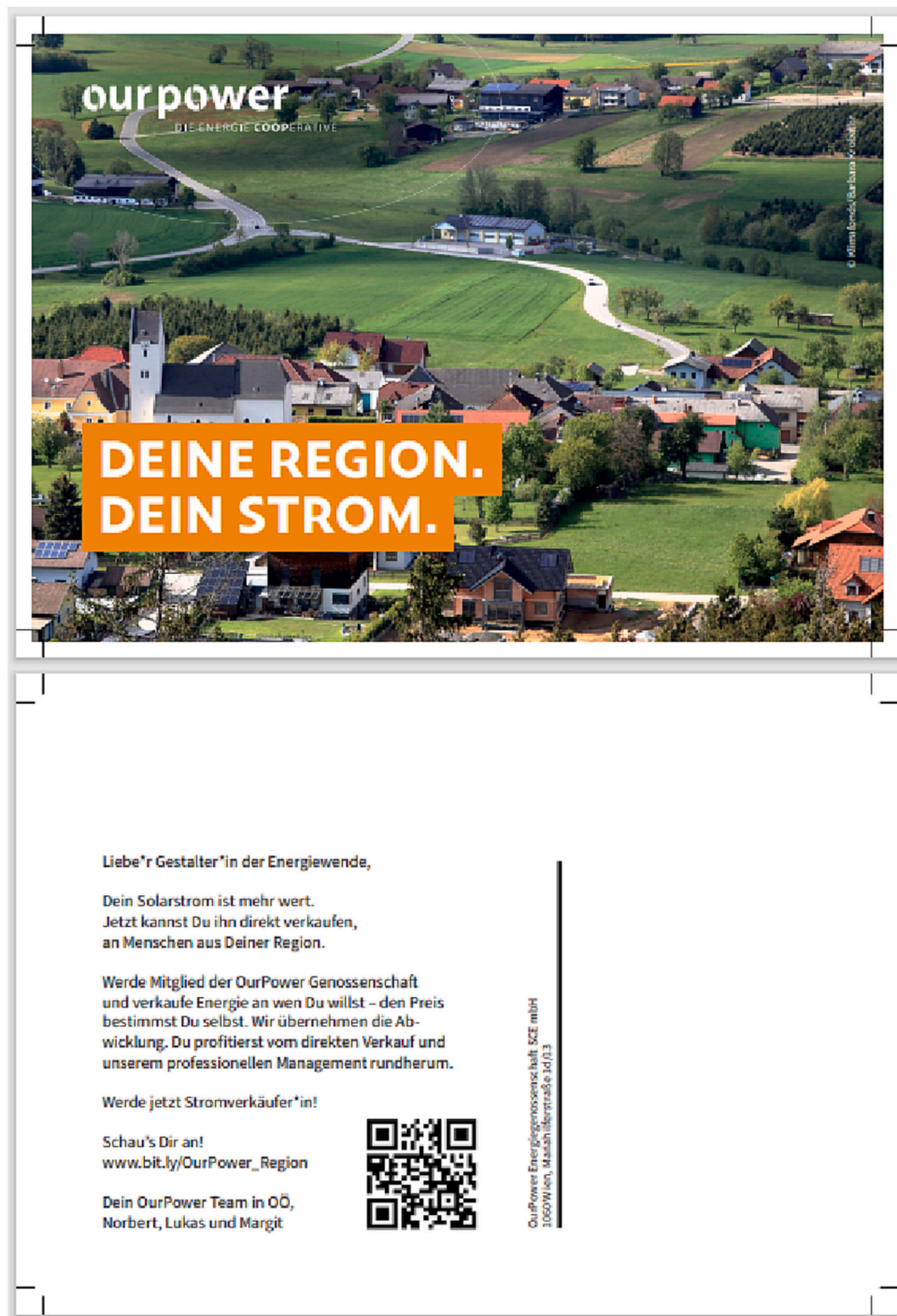
Starting on Sept 30, 2021, and in the following two weeks, postcards were delivered to participants. Engagement with the website was measured until December 31, 2021.

### 2.2. Sample details

OurPower holds a list of households with solar panels in Austria (post codes starting with 2, 3, 4 and 5), assembled by identifying solar panels on roofs on satellite imagery via algorithms. 9000 automatically identified addresses were used for this trial, randomized into three groups of 3000 using R with no special assignment regarding the geographical distribution. The postcards were sent to these addresses, with 575 distinct towns targeted, with a median of 14 postcards per town (mean = 14.59, min = 1, max = 82) and 6290 distinct streets targeted, with a median of 1 postcard per street (mean = 1.43, min = 1, max = 9), making spillovers possible but unlikely. A human quality check for accuracy identified 287 non-existing addresses after the send-out, leaving 8713 as existing household addresses (region  $N = 2894$ , climate  $N = 2908$ , friends  $N = 2911$ ). No further information was available for these households, so no claims can be made with regards to representativeness of the population of prosumers in or beyond Austria. The sending procedure was outsourced to a printing company, which used the Austrian

<sup>1</sup> Your solar power is worth more. Now you can sell it directly

- (1) to people from your region. (REGION)
- (2) to your neighbours and friends. (FRIENDS)
- (3) and more effectively act against climate change. (CLIMATE) Become a member of the OurPower cooperative and sell energy to whoever you want – and you decide the price. We take care of the transaction. You profit from direct sales and our professional management. Become an electricity seller now. Your OurPower Team in Upper Austria, //names//



**Fig. 1.** Example Postcard – Region framing. Front side shows image of a region in Upper Austria. Back side shows the recipient text as well as the QR that participants could use to reach the landing page.

postal system.<sup>2</sup>

### 2.3. Data collection

Each of the three versions of the postcard contained a link and QR code that forwarded participants to one of three landing pages created by OurPower for the study, each matching its postcard's design; one

website landing page example (region condition) can be seen in Fig. 3. All landing pages can be seen in full in Appendix A Supplementary data.

<sup>2</sup> No delivery tracking was used as this would have substantially increased the costs of the experiment.





Fig. 2. Three postcard front side designs. Left: Region framing condition. Middle: Peer-group framing condition. Right: Climate framing condition.



Fig. 3. OurPower landing page example. Left: Postcard-specific landing page with blue button as a click-through option to the sales page. Right: Official OurPower homepage to which participants were forwarded after clicking “sell”. Following this, personal information was requested from the participants in order to sign up.

Below the tagline, a button invited participants to sell<sup>3</sup> their electricity as a member of the OurPower cooperative (see blue button in Fig. 3). The rest of the landing page had information about OurPower and the cooperative membership.

As our dependant variables, OurPower’s website data analytics<sup>4</sup> logged visit of the landing page, time spent on the page, engagement with the link to sell electricity (click-through rate), as well as whether the visitor was a returning visitor. Our measures target these constructs: we investigate visit of the landing page as a metric for interest in the energy cooperative, with time spent on the page indicating the strength of the interest. Click-through rates are assumed to be a metric for intention to participate in the energy cooperative and sell electricity.

Data was analysed using R statistics, `chisq.test` for the overall model result, and the `glm/lm` function for regression analyses comparing the conditions, using `logistic.display` to report odds ratios and their

confidence intervals. We first generated a dataset over the 8713 households, including their postcard conditions, assigning random IDs per participants. A webpage visits column was added, coding participants that did not visit as 0, participants that did visit as 1. This dependent variable was used in the first analysis reported below. Then the website analytics used for the below reported exploratory analyses were merged with participants coded 1 – i.e., their time of stay and click-through rates. Participants coded 0 received all NAs in these variables. Repeat visits were then merged in a second step using the ID variables previously generated.

### 3. Results

Of the 8713 existing households that were targeted, 271 unique visitors were logged to have visited one of OurPower’s landing pages, a 3.1 % response rate. Additionally, 61 return visits were logged.<sup>5</sup> Of the 271 visits, 103 resulted from the postcard *region*, 72 from the postcard *climate* and 96 from the postcard *friends*, considering the 8713 sent postcards, this is a mean participant engagement rate of  $M_{\text{region}} = 0.036$  ( $SD = 0.185$ );  $M_{\text{climate}} = 0.025$  ( $SD = 0.155$ ); and  $M_{\text{friends}} = 0.033$  ( $SD = 0.18$ ). We found that there was a significant difference between these

<sup>3</sup> The sell button forwarded participants to OurPower’s main page away from the landing pages and onto a page where they could, once more, click “Sell” and enter their personal information in order to receive further materials and finally decide whether to become a member of OurPower to sell their electricity. No further tracking of participants was conducted from that moment, so we have no information how many participants eventually completed registration. We therefore only report engagement with this button as a dependent variable.

<sup>4</sup> Location data was logged but proved unreliable and was discarded from analyses.

<sup>5</sup> Of the 61 return visits, 31 were in the *friends* condition, 24 in the *region* condition, and 6 in the *climate* condition.

conditions, with  $\chi^2(2, N = 8713) = 6.157, p = 0.046$ . A logistic regression confirmed that compared to the *climate* condition, participants in the *region* condition were more likely to visit the website,  $OR = 1.45, p = 0.016$  (CI 95 % = 1.07,1.97); a marginally significant difference was found for participants that received the *friends* postcard,  $OR = 1.34, p = 0.061$  (CI 95 % 0.99,1.83). When comparing the *friends* and *region* conditions with a Tukey post-hoc, and we did not find a significant difference,  $OR = 0.92, p = 0.584$  (CI 95 % = 0.7,1.23).

Furthermore, for exploratory analyses, we logged click-through via the “Sell”-Button from 73 of the 271 visitors. Of these, 18 had received the *climate* postcard, 17 the *friends* postcard, and 38 had received the *region* postcard. Fig. 4 shows this comparison, with a significant difference found between postcard conditions,  $\chi^2(2, N = 271) = 9.479, p = 0.008$ . We did not find a difference in the click-through rate compared to the baseline *climate* condition, neither of participants in the *region* condition,  $OR = 1.75, p = 0.099$  (CI 95 % 0.90,3.41), nor in the *friends* condition,  $OR = 0.65, p = 0.251$  (CI 95 % 0.30, 1.36). We did find in a post-hoc comparison that participants in the *region* condition were more likely to click on the “Sell” button than participants in the *friends* condition,  $OR = 2.72, p = 0.003$  (CI 95 % = 1.41,5.25).

For the visit duration, 145 datapoints were logged.<sup>6</sup> This measure correlated with click-through rates at  $r = 0.45, p < 0.001$ . We found that participants in the *region* condition ( $N = 38$ ) spent significantly more time ( $M = 73.5$  s,  $SD = 50.4$ ) on the website compared to those in the baseline *climate* condition ( $N = 46, M = 22.9$  s,  $SD = 38.9$ ),  $b = -50.67, p < 0.001, \eta^2p = 0.20$  (CI 95 % = 0.11,1), and also than participants in the *friends* condition ( $N = 61, M = 17.5$  s,  $SD = 27.6$ ),  $b = -56.39, p < 0.001, \eta^2p = 0.26$  (CI 95 % = 0.17,1). We did not find a difference between the latter two,  $b = 5.722, p = 0.466, \eta^2p < 0.001$  (CI 95 % = 0,1). Fig. 5 showcases the distribution between the three conditions. The uneven distribution into intervention groups of these participants should be noted; conclusions should be drawn with caution.

#### 4. Discussion

To test how to best activate energy prosumers by activating social identities, we designed postcards with framings targeting either personal climate, or social (peer-group or regional) identity. We employed a randomized field trial methodology and measured their engagement with the web presence of an energy cooperative and its associated P2P energy trading platform.

First, we found that the social identity framings, regional and peer-group, held an advantage over the climate identity framing in terms of page visits. We employ page visits in this case as a metric for superficial interest after receiving the postcard. We had hypothesized that energy prosumers might react more to the two non-climate framing postcards because PV owners are already aware of the pro-environmental value they add with their installations [25,26], while peer-group and regional framing might be less commonly targeted and increase the perceived value gained.

Secondly, we found that participants in the regional framing condition had a higher click-through rate compared to the other two framings. Here, we also measured time of stay as another indicator for the depth of the participants' interest. A high correlation of time of stay and the click-through rate indicated that individuals that stayed on the website longer also were more likely to click-through to sell. Thus, a similar pattern by postcard condition was observed, with participants that had received the regional framing postcard spending the most time on the landing page, with no difference in time spent between the other two conditions.

There was no additional information provided aside from the

framing on the landing pages of the three, i.e., they were otherwise identical, so we have to assume that the difference in both visit duration and click-through stems from another variable. As the click-through rate serves as our metric for intention to participate in the energy cooperative and sell their energy through OurPower, we conclude that the activation of the regional identity leads to higher willingness to invest and collaborate in the context of energy, which has been suggested in previous research on for example nature protection initiatives [45,46] and green electricity contracts [48,50].

Our findings suggest that regional identities might be a currently underutilized but highly effective way to engage individuals in pro-environmental collective actions, and maybe a specifically fruitful one for those existing prosumers for whom financial and environmental arguments add no further value. Findings that the initial engagement rate also benefitted from a peer-group framing more than from an environmental one are in line with our hypotheses deduced based on the idea that collective energy behaviors have an inherent social component and therefore might benefit from a call to social identities [34,40,41].

Appealing to a social identity might lower the risk for negative spillover effects. Since PV owners have already contributed environmentally, any additional contribution in terms of investing in an EC or a local energy trading scheme might be deemed unnecessary, a pattern also called a rebound effect [73,74]. Because social identities, at least those of explicitly pro-environmental goals, do not allow for such compensatory behavior, social identity appeals might also mitigate unintended downstream consequences of participation.

In a recent large study of energy cooperative members and current non-members in Germany, its authors found that 10 % of the non-members who were familiar with the term “energy cooperative” reported a very high willingness to invest in one (and an additional 34 % of respondents indicated a rather high willingness) [57]. While the intention-behavior gap is one possible explanation, our much lower achieved engagement rate of 3 % might also be due to the more specific targeting of individuals already owning PVs. It could be worthwhile to further investigate existing barriers of prosumers regarding their EC and P2P engagement, building on previously conducted research on motivators [13,14,64]. Additionally, further trials could examine the effects of our intervention strategy for energy consumer membership acquisition, to test whether the total engagement rate would be closer to the intentions reported by [57]. Additionally, future qualitative work could be conducted to investigate materials used to better incentivize and engage P2P prosumers and potential sign-ups to energy cooperatives.

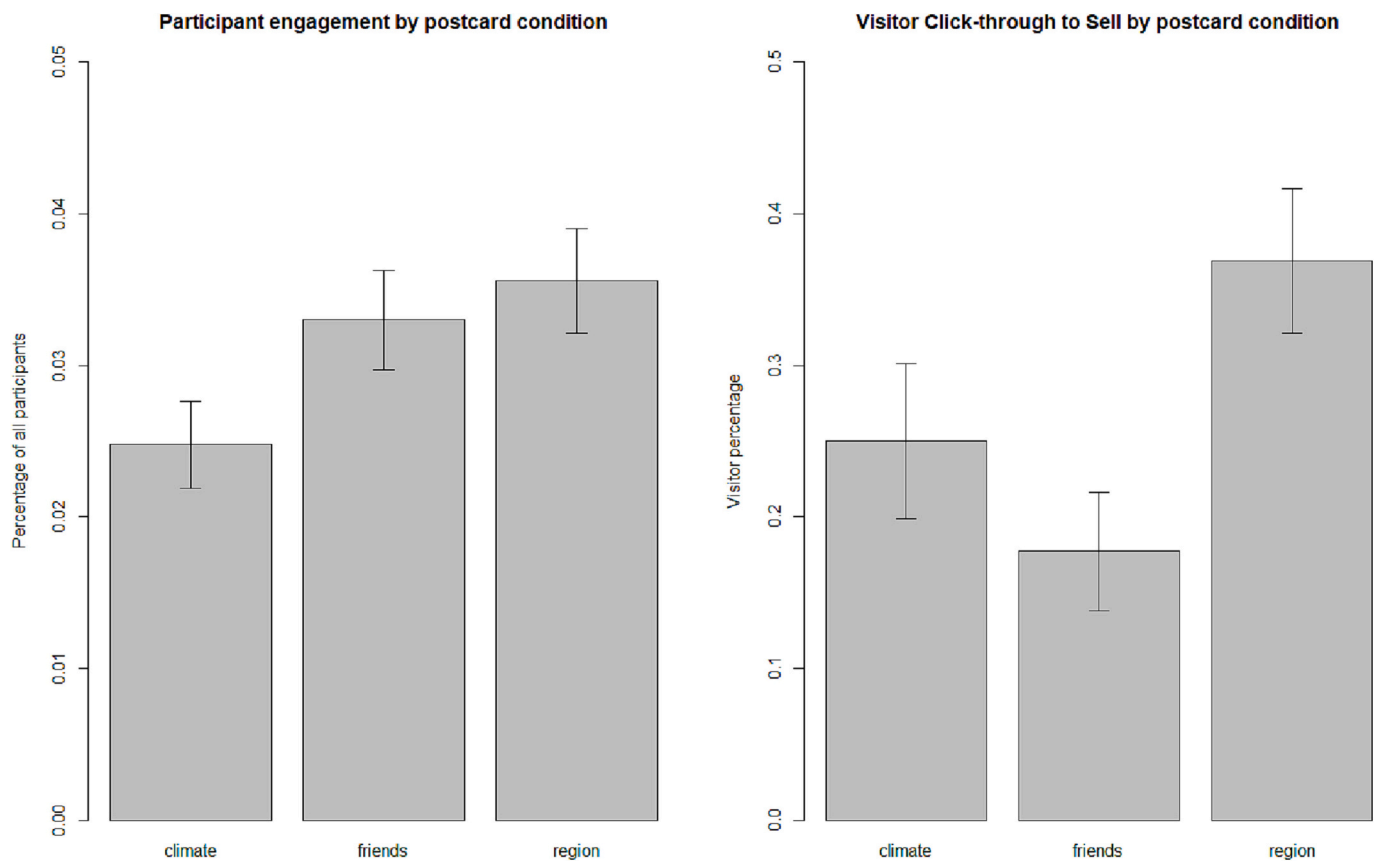
Another potential line of investigation concerns the pathway between the information seeking behavior measured in this study and decisions about selling electricity later on; such insight cannot be gained from this study. Future studies should investigate how this translation occurs, and what motivators and barriers exist towards final sign-up.

Finally, among the recent debate on behavior change research and its intended policy changing effects [75], we feel that one of our major contributions is in idea generation of effective interventions at the level of the individual (i-level changes) that can still yield system modifications (s-level changes, in this case, in power operation systems) that will increase democratization, provide more inclusive energy access, and create value for all [76–78]. It could be worthwhile for future research in this field to adopt such frameworks, and more in-depth consider system level changes at a technical, economic, and social impact level.

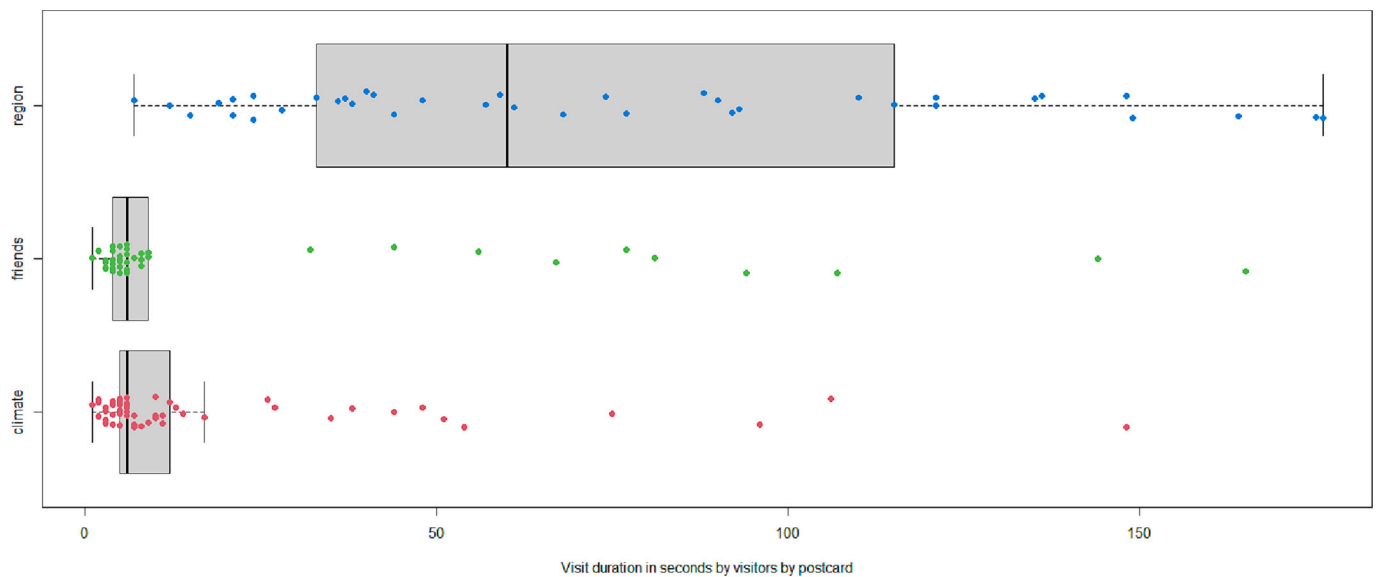
##### 4.1. Limitations

Multiple limitations deserve mention. First, we cannot make any claims as to the demographics of the targeted sample of PV owners, nor of the participants that engaged with the website beyond the fact that they were Upper Austrian residents in households owning PVs. The very specialized and small sample targeted in this trial limits the external validity. Generalizations beyond the here presented sample should be made with care, though it is noted that much research showcases

<sup>6</sup> Due to backend data logging issues, the time log was missing for 121 participants ( $N_{\text{friends}} = 35, N_{\text{climate}} = 26, N_{\text{region}} = 60$ ), and we had to exclude 5 datapoints flagged as outliers. We therefore only report this variable for a subsample of 145 of the 272 website visitors.



**Fig. 4.** Participant engagement and visitor click-through results. Left: Percentage of participants that engaged with the website after having received a postcard, by postcard condition. Right: Percentage of visitors to the website that clicked through to the Sell page, by postcard condition.



**Fig. 5.** Duration of visit: scatterplot for three postcard conditions, region ( $N = 38$ ), friends ( $N = 61$ ), climate ( $N = 46$ ).

demographic similarity of PV owning households across regions, in the sense that they are older, better educated, and wealthier [79].

Secondly, while the text content on the postcards is unambiguous regarding its framing, the picture selection was conducted by Our-Power's marketing department and was not pretested for possible confounds. The possibility cannot be discarded that the images on the postcards influenced the rate of engagement. Additionally, while the

slogans clearly target the three dimensions of climate, peer-group and region, the mechanism through which they might target or capture the respective identities in the sense that we hypothesize is unclear, as we did not have the opportunity to survey any further judgements or responses towards the images or slogans. Further study on this type of intervention is necessary to establish a clearer connection.

Finally, we report a recruitment rate of 3 %. It is difficult to judge



whether this engagement is low, as we could not find direct comparison benchmarks especially with similar target variables and participants. We can report some evidence from three unrelated postcard campaigns, which were on average much lower than ours: a postcard campaign invited to a smoking trial ( $2 \times N > 4000$ ) to which 75 participants (0.9 %) responded via phone call [80]; another postcard campaign ( $N = 60,000$ ) called for engagement with a weight management website, reporting 421 visits (0.7 %) [81]; finally, an older, non-academic postcard marketing campaign from 2009 to potential future university students reported a 0.67 % website visit response for personalized postcards, and 0.28 % from a non-personalized control group [82]. These numbers could serve to give a broad context against which to judge our response rate.

## 4.2. Conclusion

This article seeks to start a conversation on how identities can be targeted and leveraged for collective energy actions, in our case to motivate prosumers to participate in peer-to-peer energy trading. While there exists research on motivators for prospective and existing members of ECs and P2P participation, to the best of our knowledge, no experimental intervention trials have so far been conducted. We provide results from a trial in collaboration with an energy cooperative, engaging prospective prosumers for P2P energy trading. We find that activating social regional and peer-group identities showed more success than personal environmental identity. More research is needed to confirm our findings and extend on them by varying sample characteristics, employed materials, and targeted behaviors. Insights from our findings can help energy cooperatives improve their engagement and recruitment strategies with the aim to develop better functioning local P2P energy markets.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

These authors (Celina Kacperski, Mona Biel, Florian Kutzner, Sonja Klingert) report financial support was provided by the European Commission in the form of a Horizon 2020 grant.

## Data availability

Data will be made available on request.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.erss.2023.103000>.

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