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The effect of place of living on social acceptance of shared PV projects in Switzerland

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Keywords: shared PV project, renewable energy, social acceptance, conjoint experiment, place of living, rural–urban-divide

Abstract

In Switzerland, solar power has the greatest potential to further advance the energy transition. As conventional rooftop PV excludes a large share of citizens from personally contributing to climate change mitigation, shared PV (photovoltaics) projects offer a more inclusive alternative, e.g. also for urban residents who are less likely to have the option to install solar panels on their own roof. Thus, investigating people's preferences depending on the degree of urbanity of their place of residence is crucial to determine socially acceptable PV project designs. Using original Swiss survey data ($N = 3000$) and applying conjoint analysis, different preferences both depending on respondents' place of living as well as for different dimensions of social acceptance are found. Most notably, big city residents are generally most in favour of such projects but they exhibit the lowest willingness to actually invest. The conjoint experiment showed that, regarding the DVs of project rating and project choice, only the reimbursement by credit vouchers significantly improved project acceptance for big city residents. This also holds true for rural residents, where, in addition, tax deductions (reimbursement), traffic infrastructure, large consumer roofs (location) and electricity provider were also positively evaluated. For the DV specifying the amount of PV modules bought, no project attribute level managed to significantly increase this number, for which only investment-reducing factors were identified: Residents from big cities invest less when a PV project is located in a skiing area or when the investment is made at an information event. For rural residents, large consumer roofs as a location decrease the scale of an investment. These factors should therefore be avoided when planning a shared PV project in order to maximise investments. Fulfilling respective preferences (i.e. according to projects' place-based target group) may prove relevant to enhance social acceptance of shared PV projects.

1. Introduction

Despite the necessity to decarbonise energy systems, worldwide, the share of renewable energy consumed only averaged 14% (Ritchie *et al* 2024). Even many Western regions still exhibit rather negligible shares of renewable electricity generation and consumption. Whereas 19% of total electricity consumption was made up by renewable energy sources in the EU, it only amounted to 11% in the U.S.—which is comparably low to the average share on the African continent (10%) but noticeably lower than in China (16%) (Ritchie *et al* 2024). Worldwide, hydropower makes up the biggest percentage of renewable energy consumption (Ritchie *et al* 2024). With climate change progressing and thus exacerbating the problem of droughts, it remains unclear whether further expansion of this energy source is feasible. Turning again to more industrialised regions, for example the EU and the U.S., the majority of renewable energy consumption there is made up by wind energy, an energy source that faces substantial (social) barriers of further expansion (see e.g. Schmid 2023). On the contrary, the share of solar power is currently rather low (Ritchie *et al* 2024) and accordingly still has big potential for expansion. Another advantage is that solar power is highly socially accepted (Sütterlin and Siegrist 2017, Azarova *et al* 2019) and therefore probably easiest to expand without encountering societal resistance. Thus, the most promising way to advance the energy transition (and therefore also contribute to climate change mitigation) is to focus on solar power. Apart from conventional PV installed on rooftops, there exists another and more inclusive[1], but so far insufficiently considered possibility: Solar power projects.

While conventional PV is widely accepted by society (Sütterlin and Siegrist 2017, Stadelmann-Steffen *et al* 2018), more large-scale energy plants have been shown to be less popular (e.g. Schumacher *et al* 2019, Stauch and Vuichard 2019). Although research suggests that large-scale solar power plants are not harmful to the environment, particularly not when compared to fossil-fuelled means of power generation (Turney and Fthenakis 2011), they are often compared with industrial activities and are thus still associated with negative impacts on the environment (Nilson and Stedman 2022, van den Berg and Tempels 2022). Thus, understanding the factors which gain societal approval is key for successful project implementation (Seyfang *et al* 2013), especially because they have been ascribed great potential to decarbonise energy systems (e.g. De Marco *et al* 2014, Mehedi *et al* 2022). Being known under various labels (e.g. renewable energy project, community energy (project), community energy initiative, energy farm, decentralised renewable energy system, shared energy project), in recent years, a number of studies have been conducted to delve deeper into the factors that foster both economic and technical feasibility (e.g. Herche 2017, Fleischhacker *et al* 2019, Hafez *et al* 2020, Bloem *et al* 2021, Gjorgievski *et al* 2021), environmental impacts and performance (e.g. Hernandez *et al* 2014, Semeraro *et al* 2018, Mehedi *et al* 2022) as well as social acceptance of different energy projects (e.g. Goedkoop and Devine-Wright 2016, Pascaris *et al* 2021, Stadelmann-Steffen and Dermont 2021, Vuichard *et al* 2022, Trandafir *et al* 2023). In the present study, focusing on solar energy, they will be called *shared PV (photovoltaics) project*[2]. Such projects have been proposed as a new way to transition societies towards low-carbon energy systems (Seyfang *et al* 2013). Shared PV projects distinguish themselves from conventional PV in the following ways: To start with, they are not built upon an individual's personal roof. Instead, they are located in public or commercially-used areas. Further, they are more large-scale in size than private rooftop PV systems since these projects consist of a larger cluster of solar panels[3]. As is inherent in the name, shared PV projects are also collectively funded by many private actors and are provided by a supplier who pools these small investments to finance a bigger project. For this reason, they might also be seen as an investment opportunity.

Accordingly, some research suggests that the main motive to invest in such PV projects is financial (Seyfang *et al* 2013), however, the investments only seem to pay off in the long run, if at all (Reinsberger and Posch 2016). Therefore, other, i.e. more ecological, motives could also be at play when choosing to invest in such renewable energy projects, which past research has shown to be more pronounced for urban population groups (see Mantegazzi 2021). In addition, urban residents are less likely to own the roof of their dwelling (e.g. due to living in more densely populated areas), therefore, they also lack the opportunity to contribute to climate change mitigation and the energy transition by installing their own rooftop PV. As shared PV project investments start at comparatively low prices, they still offer the opportunity for everyone to participate in, which, on the other hand, could also be attractive for less financially well-off people, such as rural residents. Since urban and rural residents quite often do not share the same opinions (e.g. Hermann *et al* 2023, Zumbrunn 2024) and because social acceptance of shared PV project design depending on various places of living has not been looked into so far, an investigation into the matter is crucial. Potential differences have important implications, such as the need to tailor project design to the target group, i.e. meeting the needs of citizens in order to avoid negative effects for social acceptance (van den Berg and Tempels 2022). Therefore, this paper's research question is:

How does place of living shape social acceptance of shared PV projects?

This research question will be investigated in Switzerland, a country that has had notorious rural–urban-conflicts for a long time, which also often manifests itself in its quarterly-held votes. There, the

[1] As explained later-on, more inclusive is meant in the sense of allowing anyone to participate and invest in such projects. These projects, unlike conventional PV, are not restricted to those individuals who own the roof of their dwelling.

[2] The label 'shared (PV project)' was chosen after carefully considering alternatives used in previous research. For one, confusion with survey respondents had to be avoided by using the term 'community', which is a German synonym for 'municipality'. This study assumes that such projects can, but do not necessarily have to be built in a respondent's community or municipality. Still, an emphasis had to be placed on the collective investment character, i.e. that these projects are not solely financed by a large provider or investor but by many private actors. This study's conjoint design further renders the ex ante labelling of such projects challenging due to it is varying project constellations. Following Hernandez *et al* (2014) for example, depending on a project's location (and therefore its size) alone, one would have to differentiate between non-residential or utility-scale PV. Goedkoop and Devine-Wright (2016) on the other hand distinguish between a process- (i.e. who sets up and runs the project) and an outcome-dimension (i.e. how benefits are shared). Depending on preferred reimbursement- and provider-attributes determined in the scope of this study's conjoint experiment, the projects would either have to be placed on one side or the other of the two respective dimensions.

[3] In this study, shared PV projects are assumed to be of intermediate size (and therefore energy generation), i.e. larger than private PV systems but smaller than industrial-scale solar farms. Depending on a project's location, its size would naturally vary.

difference in voting behaviour is especially visible between big cities and rural regions[4], with big cities being outvoted by the majority in 50% of votes (e.g. Hermann *et al* 2021). Recently, this was for example also the case in the vote on the revised CO2 law in 2021 that was rejected and where rural–urban differences reached an all-time high (31.7 percentage points) (Hermann *et al* 2023). Ultimately, if new environmental measures get declined at the ballot, the creation of other opportunities (such as renewable energy projects) is both justified and necessitated. This would also allow urban residents to contribute their desired part to climate change mitigation. Implicating the relevance to go beyond top-down policy-making and find alternative ways to accelerate the energy transition in Switzerland, which might primarily be of interest to urban residents (both due to their more ecological predispositions as well as their inability to install solar PV on their own rooftop), investigating the conditions which make shared PV projects attractive to invest in is the next logical step. While the main focus of this analysis will lie on urban residents, comparing their preferences to those of rural residents further allows to see if, after all, there does exist a divide in preferences for shared PV project design between these two often dissenting regions. In this case, project design could also be adapted depending on the place of installment or the target group.

By finding answers to the research question above, contributions to existing research can be made in the following ways: For one, as just elaborated, establishing alternative ways in which (especially, but not exclusively) urban residents can contribute to climate change mitigation and the energy transition in the form of shared PV projects has so far not been investigated, i.e. eliciting their preferences for project design remains understudied. This is also in accordance with Vuichard *et al* (2021), who suggested the study of specific population groups in regards to shared PV projects. Two, empirically, by conducting conjoint analysis, respondents are encouraged to form their decision based on multiple criteria, making this survey experiment more realistic by avoiding oversimplification of an otherwise complex and multidimensional issue (Auspurg and Hinz 2014). To the best of the author's knowledge, no systematic comparison between rural and urban preferences for shared PV project design has so far been conducted. And three, looking at socio-political as well as market acceptance (see Wüstenhagen *et al* 2007) allows for the comparison of more general preferences towards shared PV projects with more specific (stated) willingness to invest in these projects. As aspects surrounding technical and economic feasibility have already been looked-into and past research has called for studies investigating other factors as well (see Mehedi *et al* 2022), this paper takes on a social science perspective by asking respondents about their preferred project attributes, thus hoping to gain insight into social factors that could increase investments in these renewable energy projects. Overall, this study contributes to a more encompassing and multidisciplinary understanding on how to efficiently and sustainably transform energy systems.

2. Theoretical background

2.1. Place of living and social acceptance of shared PV projects

Falling back on the social acceptance concept by Wüstenhagen *et al* (2007), which consists of the three dimensions of socio-political, community[5] (Roddis *et al* 2020). and market acceptance, this study focuses on the first and the latter. Socio-political acceptance is the most superficial dimension of social acceptance and therefore typically achieves the highest values, as it asks about general approval of a matter and does not address specifically planned projects. Market acceptance on the other hand measures respondents' willingness to adopt, participate or invest in something. From a practical point of view, this makes it the most important dimension of social acceptance, as it can bear actual implications. Due to this, market acceptance rates tend to be lower than those for socio-political acceptance (see e.g. Pascaris *et al* 2021).

So far, a considerable amount of research has been conducted on social acceptance of environmental policies (e.g. Beiser-McGrath and Bernauer 2019, Fremstad *et al* 2022), technologies (e.g. Thomas *et al* 2019, Batel 2020, Brückmann *et al* 2021) or renewable energy (projects) overall (e.g. Cousse 2021, Vuichard *et al* 2022). Similarly, a sizeable number of studies has looked into various causes and effects of the rural–urban-divide (e.g. Lipset and Rokkan 1967, Brookes and Cappellina 2023, García del Horno *et al* 2023, Zumbrunn 2024), but surprisingly, no consensus seems to have been reached yet for rural–urban preference differences regarding various environmental issues. Due to this paper's special focus on rural and urban residents, hereafter, only literature investigating attitudes, behaviours or social acceptance of environmental issues or renewable energy depending on people's place of living will be looked into. For example, while

[4] Between 2020 and 2022, voting results differed, on average, by 17 percentage points between big cities and rural areas (Hermann *et al* 2023).

[5] Community acceptance focuses on residents' acceptance of specifically and locally planned projects, i.e. close to respondents' place of living (Wüstenhagen *et al* 2007). An empirical study looking at community acceptance of a large-scale farm was, for example, (Roddis *et al* 2020) conducted by.

Chinese rurals have lower environmentally-friendly attitudes than urbans (Yu 2014), the opposite was true in a study conducted in Utah (U.S.) (Larson and Krannich 2016). Regarding environmentally-friendly behaviour, another U.S.-study from Kentucky showed that, despite not being more environmentally-conscious, urbans behaved better than rurals (Ambrosius and Gilderbloom 2015). On the other hand, Spanish (Berenguer *et al* 2005) and Mexican rurals behaved more environmentally-friendly than their urban counterparts (Duron-Ramos *et al* 2020). In Switzerland, the degree of urbanity has not been linked to electric vehicle adoption (Brückmann *et al* 2021), environmental awareness in general or the level of approval to climate- or energy policy measures in specific (Brügge *et al* 2023). However, periurban residents behave less environmentally-friendly than rural residents, despite having higher climate change awareness (Brügge *et al* 2023). These findings seem to be a first indication of the complex and context- as well as issue-specific nature when it comes to comparing urban and rural preferences in topics related to environmental protection, broadly speaking.

Turning to existing research on renewable energy (project) acceptance, evidence on rural–urban-comparisons is even more sparse. Arguing theoretically, one could expect urban residents to be more accepting of such shared PV projects due to their more pronounced post-materialistic values (Mantegazzi 2021). In Poland, acceptance of wind energy projects indeed seems to be higher in small cities than in rural areas (Liebe *et al* 2017). For solar energy, research revealed yet again other findings: In the Netherlands, those living in the city center were least willing to install solar panels (Halleck Vega *et al* 2022). In Utah (U.S.), no relationship between the degree of urbanity and the willingness to accept solar PV in one's close proximity was found (Larson and Krannich 2016). Place of living also did not significantly predict acceptance of solar parks in Switzerland (Cousse 2021) or conventional solar energy in Germany (Liebe and Dobers 2019). Specifically looking at large-scale solar PV facilities, in California (U.S.), rurals were supportive of such installments, while the relationship was insignificant for urbans (Carlisle *et al* 2014). Despite these inconsistencies, in summary, empirical research seems to slightly point to the direction that rural residents are more accepting of (more large-scale) renewable energy infrastructure. Theoretically, such findings might be explained by the fact that rural residents are more accustomed to conventional PV and this familiarity-effect spreads to shared PV projects (compare e.g. Cousse *et al* (2020) for familiarity with wind energy). This leads to the formulation of the first two hypotheses:

Hypothesis 1a. *On average, rural residents are more accepting of shared PV projects than urban residents.*

Hypothesis 1b. *On average, urban residents are more accepting of shared PV projects than rural residents.*

As recognised by Brügge *et al* (2023), environmental attitudes and behaviours do not have to be in line: While urban and rural residents in Switzerland exhibit similar environmental attitudes, differences for behaviours at most exist for voting on environmental issues, due to rural and urban regions being affected differently by certain policies. Going beyond general acceptance and looking at actual willingness to invest, findings from Germany show that residents from rural and suburban areas were more willing to invest in local renewable energy projects than urban residents (Kalkbrenner and Roosen 2016). This would be the logical extension following hypothesis 1a: Rurals that are more accepting of solar PV should also be more willing to actually invest in these projects. Nonetheless, the empirical findings (that led to hypothesis 1a) are somewhat counterintuitive, as urban residents in Switzerland are considerably more ecological (Mantegazzi 2021), which would suggest higher (instead of lower) acceptance of renewable energy expansion such as solar energy. Inconsistencies in previous research might also be owed to the fact that different studies (sometimes unknowingly) investigated different dimensions of social acceptance, which, as elaborated above, results in varying levels of approval. Therefore, it is argued that, despite rurals potentially being more accepting of shared PV projects in general and due to them being more likely to already have conventional PV on their own rooftops, urbans could still be more willing to invest in shared PV projects (and have better financial prerequisites due to having slightly higher equivalent income than rurals (Federal Statistical Office 2024b)). This would also be in line with urban voting behaviour on environmental issues (Brügge *et al* 2023). Therefore, two contrasting hypotheses are once again opted for:

Hypothesis 2a. *On average, rural residents are more willing to invest in shared PV projects than urban residents.*

Hypothesis 2b. *On average, urban residents are more willing to invest in shared PV projects than rural residents.*

2.2. Rural and urban preferences for shared PV project design

Going into more detail and looking at different (shared) PV project attributes that could be determining for social acceptance, a more comprehensive picture of the rural–urban preferences can be created. As has been shown in the past, project design greatly matters (see e.g. Trandafir *et al* (2023) studying large-scale solar developments, Pascaris *et al* (2021) investigating agrivoltaics or Vuichard *et al* (2021) looking at utility-scale alpine PV). Apart from these studies, no research on socially-accepted solar PV project design (derived from conjoint analysis) seems to exist so far, neither in Switzerland nor elsewhere. Owed to this research gap, initially, related studies had to be consulted, from which some shared PV project attributes were derived and later-on validated by PV experts (see section 3.2). In conclusion, the following project attributes might prove relevant and differ in regards to the two dimensions of social acceptance, depending on respondents' place of living (i.e. the degree of urbanity): the way in which project investors are reimbursed, the project's location as well as who provides such a project[6].

As is usually the case when financial aspects are involved, the **form of reimbursement** to shared PV project investors is also likely to greatly influence social acceptance (e.g. Salm *et al* 2016, Curtin *et al* 2019). As shared PV projects are one form of crowdfunding, the according literature suggests two possible forms of return on investment: financial and non-financial (e.g. Hossain and Oparaocha 2017). Even though shared PV projects do not pay off financially, at least not in the short run (Reinsberger and Posch 2016), receiving some form of monetary compensation (e.g. tax exemptions, subsidies, car charging discounts, payouts) have been found to be most attractive to (potential) investors (e.g. Liebe *et al* 2017, Süsser and Kannen 2017, Strazzera and Statzu 2017, Kim *et al* 2020, Li *et al* 2020, Vuichard *et al* 2021, Trandafir *et al* 2023). On the other hand, also non-financial or symbolic forms of reimbursement are possible and can positively influence social acceptance of shared PV projects (e.g. Sloot *et al* 2019, Schall 2020). Research has further shown that sustainability-oriented investors care more about non-financial returns (Hornuf *et al* 2022). As urban residents are more ecological and exhibit more post-materialistic values (Federal Statistical Office 2019, Mantegazzi 2021), the expectation is also for urban residents to be more accepting of non-financial forms of reimbursement than rural residents:

Hypothesis 3. *Urban residents are more supportive of non-financial forms of reimbursement than rural residents.*

Similarly relevant seems to be the **location** of renewable energy infrastructure, which has long been established by research (e.g. Tabi and Wüstenhagen 2017, Sharpton *et al* 2020, Pinto *et al* 2021, Rodríguez-Segura *et al* 2023), most famously in the NIMBY-phenomenon (Wolsink 2000). In this regard, evidence remains mixed, with some studies showing a preference for renewable energy projects placed close to respondents' place of living (Lee *et al* 2018, Rodríguez-Segura *et al* 2023) and others finding a preference against this closeness (Liebe and Dobers 2019, Kim *et al* 2020, Sharpton *et al* 2020). Compared to other energy sources, solar power is however most tolerated in respondents' vicinity (Bertsch *et al* 2016). Further, research suggests that renewable energy projects placed in natural or tourist areas lower social acceptance (Süsser and Kannen 2017, Rodríguez-Segura *et al* 2023)[7], while they are supported when located on agricultural and industrial land (Stadelmann-Steffen and Dermont 2021, Vuichard *et al* 2022, Rodríguez-Segura *et al* 2023). In addition to these general findings, research has also shown that rural residents prefer energy infrastructure (overhead grid expansion, specifically) farther away from them than urbans or suburbans[8] (Bertsch *et al* 2016). The combination of these findings leads to the next hypothesis:

Hypothesis 4. *Urban residents are more supportive of shared PV projects located on existing local infrastructure than rural residents.*

And lastly, the **provider** could also matter to investors, as not all of them might be ascribed the same amount of trust. Chan *et al* (2017) were the first to highlight the potential relevance of shared PV project factors such as who owns and manages the project, however, this has not been empirically tested so far. The differentiation could be made both between public vs. private and local vs. national (or even international) providers. Since locally-situated firms also add to local economic value (Rodríguez-Segura *et al* 2023), it can be expected that local providers are preferred (see e.g. Hille *et al* 2018, Lienhoop 2018, Curtin *et al* 2019, Vuichard *et al* 2022). Further, because Switzerland does not have a fully liberalised energy system (see e.g. Ammann 2023), Swiss citizens are naturally more used to public energy suppliers. Since other studies investigating acceptance of renewable energy projects showed preferences for public over private energy

[6] In the analyses, two other attributes are included to make projects as realistic as possible: price per module and the way in which investors learn about and invest in shared PV projects.

[7] This aversion to placing large-scale solar farms in nature has also been called 'green-on-green'-conflict, which addresses the trade-off between the recognised need to decarbonise energy systems and the concern of adverse impacts on the environment (Roddis *et al* 2020). As shown by Semeraro *et al* (2018), such land use competition can be extenuated when areas used by PV systems are assigned another purpose (i.e. being in line with the multifunctional character of landscape).

[8] The existence of suburbs/agglomerations is, of course, acknowledged, too. They are also included in the analyses. Due to this paper's focus on urban residents, and suburbs being an intermediate category between urban and rural regions, primarily urban preferences are looked at to identify potential differences between the two ends of this spectrum. Therefore, theoretical differences between suburbs and cities will not be delved deeper into.

suppliers as well (Hammerle *et al* 2021, Stadelmann-Steffen and Dermont 2021), preferences for public providers can also be assumed in this study. Due to urban residents being more politically left-orientated (Federal Statistical Office 2019), which is generally associated with a preference for public service provision (e.g. Elinder and Jordahl 2013), urbans might accordingly also have a higher propensity to support public providers than rural residents. On the other hand, rural residents might place more value on local providers due to the local economic benefits (e.g. Bergmann *et al* 2008). This argumentation is also supported by studies from Goodhart (2017) and Hegewald (2023), who show that rural residents feel more attached to their place of living and indeed prefer local institutions (whereas urban residents favour national institutions). The last two hypotheses can therefore be summarised as:

Hypothesis 5. *Urban residents are more supportive of public providers than rural residents.*

Hypothesis 6. *Rural residents are more supportive of local providers than urban residents.*

3. Research design

3.1. The case of Switzerland

As discussed in section 2.1, at least in general surveys, urbanity does not seem to systematically influence factors such as environmental awareness or behaviour in Switzerland (see e.g. Brügge *et al* 2023). However, in recent years, the rural–urban divide has been prominently picked up by media when discussing various voting results (e.g. Hermann *et al* 2021), not just for ballot proposals overall but also for environmental issues, such as the CO2 law, the *Trinkwasserinitiative* ('initiative for clean drinking water') or the *Pestizidinitiative* ('initiative against the use of pesticides'), where approval ratings vastly differed between rural and urban areas (see Hermann *et al* 2023). Against this backdrop, large-scale PV projects might also be seen as a political avenue (especially given forms of reimbursement that are supported and regulated by the state) and therefore be split in terms of social acceptance along the rural–urban-spectrum. Therefore, it seems plausible to investigate the potentially diverging preferences for shared PV projects in Switzerland. Like many other countries at the moment, Switzerland has to transition its energy system towards a more sustainable and renewable state, with the expansion of solar energy being the most promising way ahead (e.g. Trutnevyte *et al* 2024)[9]. Furthermore, in a federalist context as present in Switzerland, energy policy is primarily situated at the cantonal or even local level, which allows policymakers to directly address the needs and preferences of local residents (which might differ depending on respondents' place of living) (Vatter 2020) and hence offers optimal conditions to expand shared PV projects. Most notably, in 2022, 65% of the Swiss population lived in urban areas, 21% in suburbs and 14% in rural areas (Federal Statistical Office 2024a), which leaves a large majority of the target group (i.e. urbans) in the region where shared PV projects are assumed to unfold their biggest potential.

3.2. Data

The data used to analyse whether project characteristics do, in fact, influence social acceptance of shared PV projects differently depending on where people live stems from an original survey conducted in the scope of the SWEET-EDGE project in Switzerland between August and October 2022 (see Stadelmann-Steffen *et al* 2022). The sample, encompassing close to 3000 respondents, was randomly drawn from the Swiss population register and is representative for the Swiss population[10]. Some descriptives can be found in appendix A.1.

In the scope of this survey, a choice experiment (see also Brückmann *et al* 2024) was included in order to establish which shared PV project characteristics were perceived more or less favourably, depending on respondents' place of living. Figure 1 illustrates the study's set-up and in appendix A.2 as well as in appendix A.3, an example of one conjoint scenario, as presented to respondents, is displayed.

Correspondingly, the five project characteristics (i.e. attributes) served as independent variables[11]. These attributes were derived from, first, consulting existing literature on the topic and, second, discussing these findings with six PV experts and considering their practical knowledge and feedback on the matter[12].

[9] In Switzerland (2020), the share of renewable energies in total energy consumption was only 27% (Federal Department of Foreign Affairs 2021). The majority of the share of renewable energy is hydropower, which is however not expected to expand significantly anymore in the future (Swiss Federal Office of Energy 2019b). Similar to other countries, the share of solar power is still low and has therefore a lot of potential for expansion (Swiss Federal Office of Energy 2019a, Federal Department of Foreign Affairs 2021).

[10] To improve data quality, 'speeders', i.e. the fastest 10%, were excluded from analyses.

[11] Due to the experimental nature of conjoint analysis, no further control variables are needed.

[12] Expert names can be found in the Acknowledgment-section.

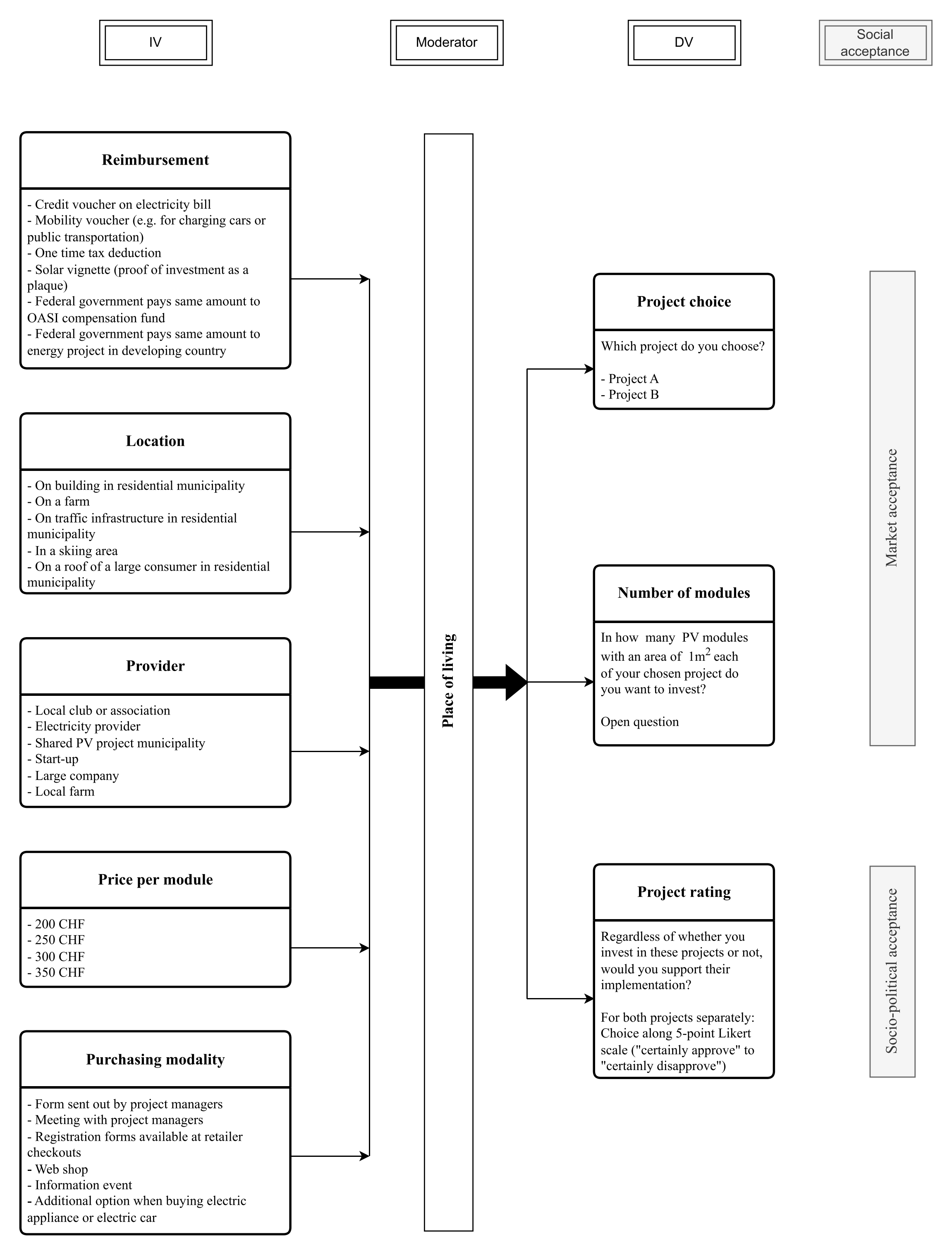

Figure 1. Study set-up: measurement and theoretical levels.
Source: Own depiction, study set-up developed by Stadelmann-Steffen *et al* (2022).

As argued in section 2.2, different project configurations might lead to different responses by potential investors, depending on (potential) investors' place of living. One such project characteristic concerns *reimbursement*, i.e. return on investment. Further, the *location* or the *provider* of a shared PV project might lead to varying project evaluations as well. Lastly, the *price* of an investment or even the *purchasing modality* could also prove influential.

Included in this conjoint experiment are three dependent variables, which capture the two dimensions of social acceptance mentioned in section 2.1. First, respondents had to choose between project A and B (*project choice*). Second, for their chosen project, respondents could indicate the amount of PV modules they intend to purchase (*number of modules*). These two dependent variables operationalise the pre-cursor to market acceptance, i.e. (stated) willingness to invest. And third, independent of their choice to invest at all, respondents could rate both projects on a scale from 1–5 (*project rating*). This more general rating question is a form of socio-political acceptance[13].

To create the subgroups regarding place of living, respondents were asked to place themselves into one of the four following categories[14]: *(1) city with more than 50 000 inhabitants, (2) city with less than 50 000 inhabitants, (3) agglomeration or suburb of a city* or *(4) village, farm or house in the countryside*. This measurement has been validated in Switzerland by Hermann *et al* (2023) or Zumbrunn (2024) for example. It should be noted that objective and subjective measurements of place of living often lead to different outcomes, however, when addressing preferences, the subjective measure seems to be more adequate (Zumbrunn 2024). As described in section 3.3, methodologically, this creation of subgroups corresponds to conventional moderation analysis.

3.3. Method

Due to the choice experiment's structure, conjoint analysis will be applied. In correspondence with standard conjoint practice, each respondent received five consecutive project comparisons (i.e. scenarios) to evaluate (Bansak *et al* 2021), where attribute levels varied randomly both between scenarios as well as between respondents. This iterated procedure allows for causal preference estimation due to the creation of counterfactuals (Hainmueller *et al* 2015, Leeper *et al* 2020). The main idea of conjoint analysis as well as its key advantage is that, in reality, humans' choice behaviour depends on multiple criteria instead of isolated factors. Conjoint experiments therefore counteract criticism regarding oversimplification of traditional surveys, where project attributes can not be tested in this randomly combined manner. Hence, the five project attributes introduced before are allowed to simultaneously be evaluated regarding the three dependent variables. This analytical strategy also reduces the probability of a social desirability bias (Auspurg and Hinz 2014, Hainmueller *et al* 2014).

Following most current developments in conjoint analysis (Leeper *et al* 2020), marginal means (MM) are calculated in order to estimate the effect of shared PV project characteristics on social acceptance. Marginal means capture 'the level of favourability toward profiles that have a particular feature level, ignoring all other features' (Leeper *et al* 2020, p 210). They 'represent the mean outcome across all appearances of a particular conjoint feature level, averaging across all other features. In forced choice conjoint designs with two profiles per choice task, MM by definition average 0.5 with values above 0.5 indicating features that increase profile favourability and values below 0.5 indicating features that decrease favourability. For continuous outcomes, MM can take any value in the full range of the outcome' (Leeper 2020). MM are especially useful when looking at different subgroups (such as place of living in this case) because they calculate interactions between a respondent's and a project's characteristics (Leeper *et al* 2020).

All calculations and statements are made at the 5%-significance level.

With Y indicating one of the three dependent variables, the following model for one of the four 'places of living'-subgroups can be estimated as follows:

$$Y = \alpha + \beta_1 \times price + \beta_2 \times reimbursement + \beta_3 \times location + \beta_4 \times provider + \beta_5 \times purchasing\ modality.$$

4. Results and discussion

4.1. Socio-political acceptance

As previously laid out, the most general dimension of Wüstenhagen *et al* (2007)'s concept of social acceptance is socio-political acceptance, where acceptance ratings are usually higher than for the other two (more specific) dimensions of social acceptance. Socio-political acceptance, in this case, amounted to a mean of 3.57 for the full sample. Since **project rating** ranges from 1-5, this value seems surprisingly low because solar energy normally enjoys high societal support. For comparison, socio-political of conventional building PV resulted in a value of 4.48 (also measured on a scale from 1–5)[15]. The project-factor, making this a special and more large-scale form of solar energy provision, might therefore explain this lower socio-political acceptance of shared PV projects. Similar findings were presented in, for example, Nilson and Stedman

[13] Community acceptance could not be captured in the scope of this survey, as we did not investigate actual and local projects at respondents' place of living.

[14] As the main focus of this study lies in the identification of differences between various places of living, the two urban categories, for example, are not combined into a single 'urban' category. The findings corroborate this decision, as there did in fact exist differences between big and small city residents.

[15] Additionally, a Wilcoxon signed-rank test indicated that these two variables are significantly different from each other.

(2022), who showed that U.S.-residents compare utility solar to industrial activities. Turning to average socio-political acceptance of shared PV projects for the four 'place of living'-subgroups, rurals exhibit a mean of 3.51, suburbans 3.64, those in small cities 3.59 and those in big cities 3.78[16]. These means are a first indication of the complexity of preferences of shared PV projects in combination with respondents' place of living. They also contradict hypothesis 1a, but are in accordance with hypothesis 1b.

In order to find out which project characteristics could further increase socio-political acceptance of shared PV projects and which ones currently keep it rather low, figure 2 provides a more detailed picture of this situation[17]. The findings for the full sample can be found in appendix A.5. The marginal means for each of the four 'place of living'-subgroups indicate that, in fact, not all project characteristics or attribute levels play an equally important role (left column). *Price* and *purchasing modality* are not determining when it comes to socio-political acceptance of shared PV projects. *Reimbursement* proves slightly more influential: All four regions support credit vouchers. Rurals and suburbans additionally support tax deductions, but reject solar vignettes and federal investments in developing countries. For *location*, respondents from big cities do not indicate significant preferences at all. Those from small cities, the suburbs or rural regions however prefer traffic infrastructure over skiing areas. Large consumer roofs are supported by rurals and suburbans, farms rejected by rurals only. The *provider* once again does not matter for project rating for respondents from big cities and is also less important for the other three places of living. Rurals support electricity providers and decline large companies, those from small cities embrace the solar plant's municipality. It further becomes evident that residents from big cities have significantly more positive attitudes towards most project attribute levels, especially when compared to respondents from rural regions (right column). This would be in accordance with hypotheses 3 and 4 as well as 5. Hypothesis 6 however has to be rejected for socio-political acceptance, as urban residents were also significantly more supportive of local providers than rurals.

The mere fact that the order in which socio-political acceptance increases presents itself as 'rural', 'small city', 'suburbs' and then 'big city' shows that one cannot simply differentiate between rural and urban—size matters. At least for socio-political acceptance, it becomes apparent that big cities are closer to suburbs in terms of preferences, while rural regions are more similar to small cities. This was also mirrored in the right column of figure 2, where preference differences for certain attribute levels were barely significant between big cities and suburbs. On the other hand, they were (not in all, but most cases) significantly different between big cities and rural regions and small cities. In the Swiss context, these findings make sense, as suburbs can mostly be found in the outskirts of big cities, whereas they are less common for smaller cities, which are more often directly surrounded by rural areas. Hence, in conclusion, socio-political acceptance does not increase linearly along the rural–urban-spectrum.

4.2. Market acceptance

After having established the more general preferences for shared PV projects for their attributes, looking at market acceptance bears even more relevance due to its practical implications. Market acceptance is the most concrete form of social acceptance and the 'last step' of or before actual implementation, as it directly asks demand and/or supply side for their willingness to accept, participate or invest in a certain matter (Wüstenhagen *et al* 2007). Therefore, the first operationalisation of market acceptance is the binary form of **project choice**. As explained in section 3.3, for binary conjoint outcomes, the mean per definition always amounts to 0.5, irrespective of any subgroups.

Figure 3[18] depicts the marginal means for project choice for all four 'place of living'-subgroups as well as the differences in MM between the 'big city'-group and the other three. Regarding *price*, while low prices are only relevant for rurals and suburbans, those from big cities dislike high prices just as much (left column). Effect sizes are, however, small. These preferences are further also not significantly different between big cities and the other three regions (right column). *Reimbursement* seems to be more influential: All four subgroups support credit vouchers but reject solar vignettes. While big city residents do not care about other forms of reimbursement, rurals for example also support tax deductions or federal compensations to the OASI fund, and, along with suburbans and small cities, reject federal investments in developing countries. In this last regard, rurals and suburbans significantly differ from big cities, supporting hypothesis 3. Next, *location* also proves central: All subgroups positively evaluate traffic infrastructure and negatively evaluate projects located on farms, with big cities being the most dismissive. However, they are indifferent towards

[16] Appendix A.4 shows that all means are significantly different from each other at the 5%-significance level. Confirming experimental assumptions, this still held true when project attributes were accounted for, i.e. included in the statistical test. With the DVs standard deviation amounting to 1.158, the difference between rurals and big city residents equals 23% of the DVs standard deviation, which can be considered as substantial enough.

[17] Numerical results for project rating and all five attribute levels can be found in appendices A.6 and A.7.

[18] Numerical results for project choice and all five attributes can be found in appendices A.8 and A.9.

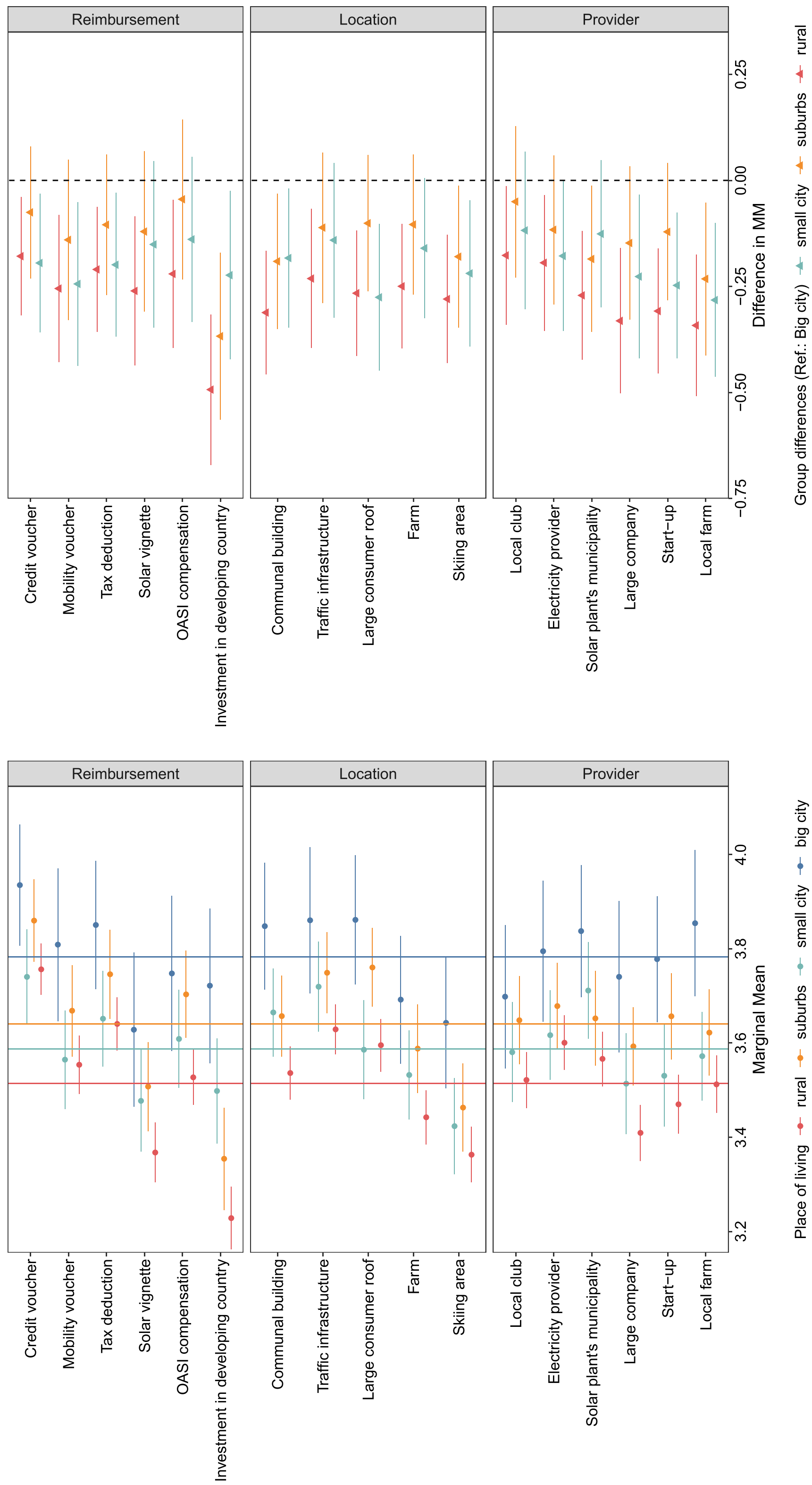

Figure 2. Project rating ($N = 2910$).
Data source: Stadelmann-Steffen *et al* (2022), own calculations and depiction.

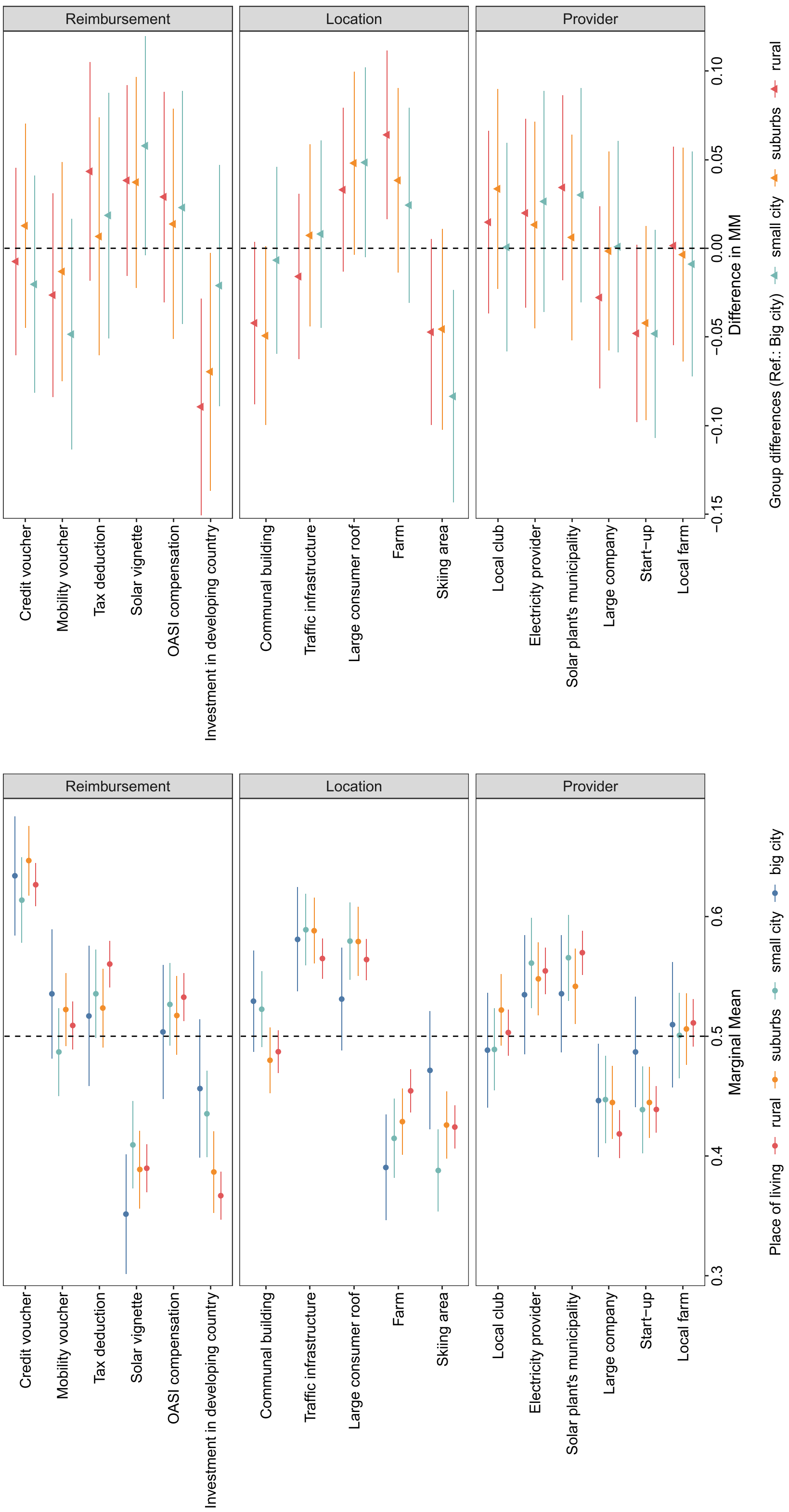

Figure 3. Project choice ($N = 2720$).
Data source: Stadelmann-Steffen *et al* (2022), own calculations and depiction.

projects being placed on large consumer roofs (with the other three groups being supportive) and skiing areas (with the other three groups being renunciative). In terms of significantly differing preferences, big cities are more positive towards skiing areas than small cities, and big cities are more negative towards farm-locations than rurals (which contrasts hypothesis 4). The only *provider* that was unilaterally judged negatively was the large company. Those from big cities were indifferent towards the other providers, however, the three remaining regions were supportive of electricity providers and the solar plant's municipality but rejected start-ups. None of these preferences are however significantly different from those of big city residents', thus leading to the rejection of hypotheses 5 and 6. Lastly, the *purchasing modality* again barely matters for project choice. Only rurals positively evaluate project manager meetings and information events but dislike buying an investment via web shop. No significant subgroup-differences are observed here.

Getting even more specific about respondents' willingness to invest in shared PV projects (i.e. the second form of market acceptance), results for (potential) investors' indicated **number of purchased PV modules** are also illustrating. On average, the full sample would have purchased 10.37 PV modules. Rural residents indicated a mean willingness to invest in 10.52 modules, suburbans in 11.58 modules, those in small cities in 9.24 modules and those in big cities in 8.11 modules[19]. As already descriptively observed for the dependent variable of project rating, results do not seem to follow a 'linear' pattern along the rural–urban-spectrum, which again becomes evident in these averages here, although the order deviates. For project rating, it used to be 'rural', 'small city', 'suburbs' and 'big city', while for the number of chosen modules, it is 'big city', 'small city', 'rural' and 'suburbs' (in ascending order of acceptance). In other words, this means that, while residents of big cities generally support the idea of shared PV projects the most, when it comes to actual investment, this is the subgroup that tends to back out the most by indicating the lowest willingness to purchase PV modules. The most obvious explanation for this finding would lie in different income distributions, i.e. that urban residents might be less affluent than rural residents. But additional analyses confirmed that income did not significantly mediate these effects[20]. Another possibility that might explain the incongruent responses between the two dimensions of social acceptance could be social desirability bias. It remains unclear whether this would concern the most urban or the rural subgroup, however, one of these subgroups could have overstated their socio-political or market acceptance, respectively. Either way, at least for this form of market acceptance, the theoretical expectation in hypothesis 2b, i.e. that those in more urban areas should be more willing to invest in shared PV projects, has to be rejected in favour of hypothesis 2a.

What remains left is to study the factors that determine high or low willingness to invest in these projects. Figure 4[21] therefore presents the marginal means for the number of modules of the project attributes for the four 'place of living'-subgroups as well as the differences in MM between the most urban subgroup and the other three places. Overall, findings are rather trifling. *Price* and *provider* are fully irrelevant for each subgroup itself. Compared to big city residents, rurals however significantly preferred a provider in the case of a start-up and local farm (right column). These findings are in accordance with both hypotheses 5 and 6. Additionally, *reimbursement* proves trivial when respondents choose their amount of PV modules. Respondents from big cities, the suburbs and rural areas do not care about any specific form of reimbursement. Inexplicably, those from small cities even reject credit vouchers (this preference is however not significantly different from those in big cities, see right column). Rurals however significantly choose more modules than those from big cities when the reimbursement is a tax deduction or an investment in a developing country (right column). Since hypothesis 3 argued that urbans are more supportive of non-financial compensation forms, both findings contract this[22]. *Location* also only has significant negative effects: Big city residents disapprove of skiing areas (and significantly more so than the three other regions) and rurals of large consumer roofs. Again looking at the differences, rurals are more supportive of traffic infrastructure, farms and skiing areas than those from big cities, which for the first finding contradicts but agrees with hypothesis 4 for the two latter findings. Lastly, for *purchasing modality*, only residents from big cities reject information events (significantly more so than rurals and suburbans) or those from small cities reject web shops. Conclusively, for the amount of chosen modules, i.e. the scale of an investment, providers can only learn about which project factors to avoid in order to gain more of investors' money.

4.3. Discussion

Looking at the full picture of how place of living shapes shared PV project acceptance, a few findings should be addressed and summarised (see also table 1 for a summary of all hypotheses): For one, shared PV projects do not enjoy the same levels of socio-political acceptance as conventional solar energy, presumably owed to the project-factor. Further, descriptively, both socio-political and market acceptance do not increase linearly

[19] Appendix A.10 shows that all means are significantly different from each other at the 5%-significance level, with the exception of 'small city' and 'big city'. Confirming experimental assumptions, this still held true when project attributes were accounted for, i.e. included in the statistical test. With the DVs standard deviation amounting to 20.73, the difference between rurals and big city residents equals 11.6% of the DVs standard deviation, which is on the smaller side regarding effect size.

[20] Regression analysis: DV 'number of modules', IVs 'place of living' and five project attributes, mediator 'income'. Compared to the reference group of rural residents, the coefficients of the other three places of living remained statistically significant when income was included in the model.

[21] Numerical results for the number of chosen modules and all five attributes can be found in appendices A.11 and A.12.

[22] Interacting the project's form of reimbursement with a respondent's income does not significantly influence the number of chosen modules.

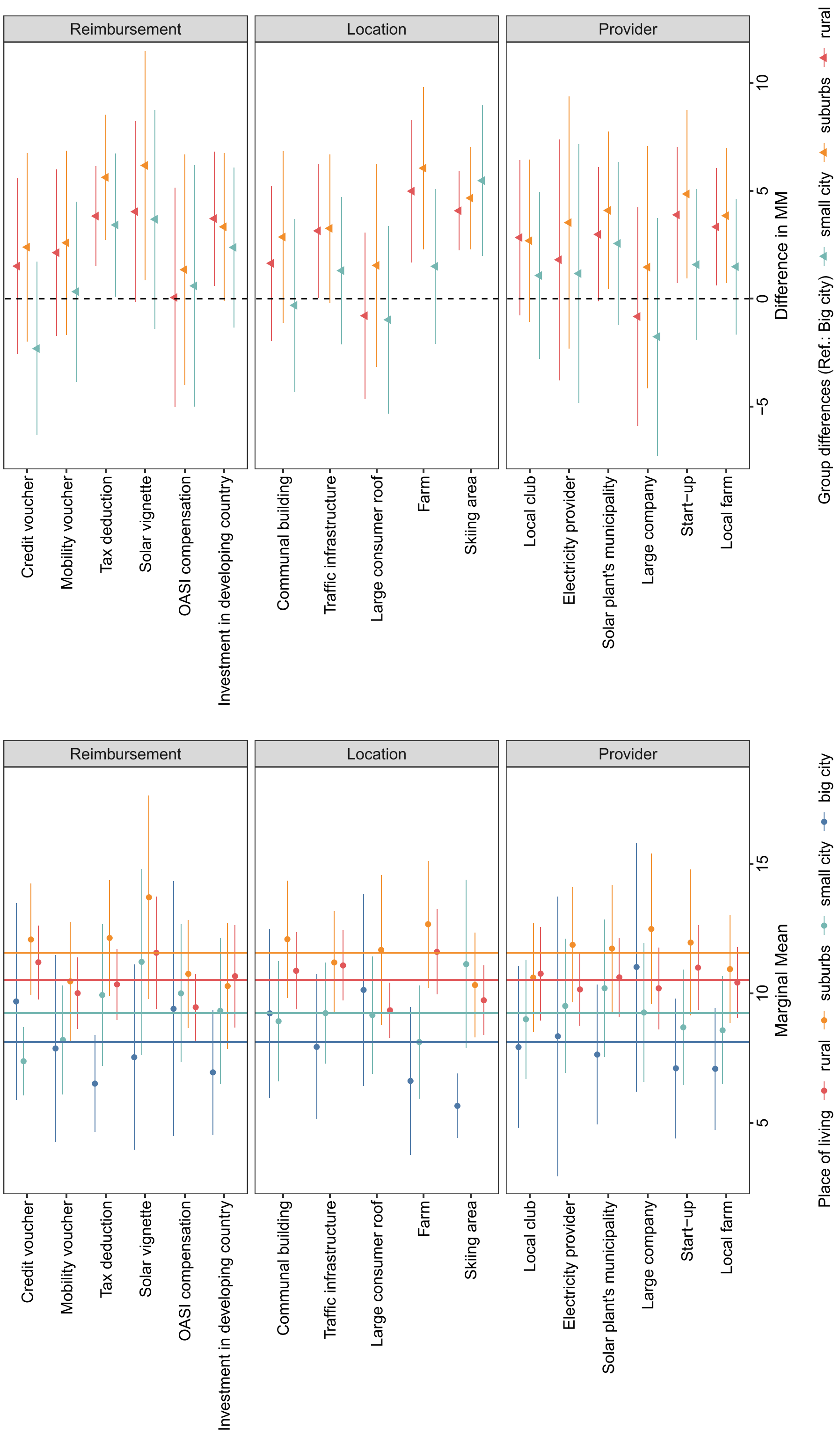

Figure 4. Number of chosen modules ($N = 2720$).
Data source: Stadelmann-Steffen *et al* (2022), own calculations and depiction.

along the rural–urban-spectrum, so the assumption that more rural residents are more accepting of (hypothesis 1a has to be rejected in favour of hypothesis 1b) and urban residents are more willing to invest in (hypothesis 2b has to be rejected in favour of hypothesis 2a) shared PV projects do not hold up. Instead, big cities seem to be more similar to suburbs regarding project preferences, while small cities are closer to rural areas. This finding is also consistent with Switzerland's geographical situation, which explains this non-linearity. It further reinforces the notion that not all cities are the same, depending on their size.

Table 1. Summary of hypotheses.

Hypothesis	Project rating	Project choice	Number of modules
H1a: On average, rural residents are more accepting of shared PV projects than urban residents.	not supported	—	—
H1b: On average, urban residents are more accepting of shared PV projects than rural residents.	supported	—	—
H2a: On average, rural residents are more willing to invest in shared PV projects than urban residents.	—	—	supported
H2b: On average, urban residents are more willing to invest in shared PV projects than rural residents.	—	—	not supported
H3: Urban residents are more supportive of non-financial forms of reimbursement than rural residents.	supported	(supported)	(not supported)
H4: Urban residents are more supportive of shared PV projects located on existing local infrastructure than rural residents.	supported	no differences[a]	no differences[b]
H5: Urban residents are more supportive of public providers than rural residents.	supported	no differences	no differences
H6: Rural residents are more supportive of local providers than urban residents.	not supported	no differences	(supported)

Notes: 'supported' = supported for all levels; '(supported)' = supported for some levels, insignificant for others; 'not supported' = opposite effects as expected in hypothesis; '(not supported)' = opposite effects as expected in hypothesis for some levels, insignificant for others; 'no differences' = no significant differences of attribute levels between big city and rural residents.
[a] But rurals are more supportive of the farm-location.
[b] But rurals are more supportive of farms and skiing areas.

Another interesting observation pertains to the fact that, while big cities were more positive towards most project attribute levels for socio-political acceptance than the other three places of living, this pattern fully reversed for the most specific form of market acceptance (number of chosen modules). These inconsistent preferences between general project preferences and stated willingness to invest might be owed to social desirability bias, as either big city residents or rurals must have overstated their social acceptance in one of the dimensions under study. Overall, the identification of significantly different effects between various places of living when focusing on an environmental issue therefore remains an exception in the Swiss context.

As socially-accepted solar PV project factors have so far barely been investigated in the scope of a conjoint experiment, and certainly not in combination with various places of living, this study also offers novel insights in this aspect. Regarding attribute levels, for urban residents, none of them were consistently significant for all three dependent variables measuring the two dimensions of social acceptance. For project choice and project rating, big city residents favoured a project when it was reimbursed by a credit voucher. For the same two DVs, small city residents positively evaluated the credit voucher reimbursement, the location of traffic infrastructure and the solar plant's municipality being the project provider. Rural residents favoured a project when it was reimbursed by credit voucher or tax deduction, located on traffic infrastructure or large consumer roofs and when supplied by the electricity provider[23]. The tendency of most residential groups to favour individual forms of reimbursement would place such projects at the 'distant and private'-end of the outcome-dimension of Goedkoop and Devine-Wright (2016, p 139's) community energy classification. The higher acceptance of locations such as traffic infrastructure (or large consumer roofs) indicates a preference of non-residential over utility-scale PV projects (see Hernandez *et al* 2014). What is more, the analysis for the number of modules identified some attribute levels that should not be offered to maximise the size of an investment, as they would significantly reduce it. There are however various project constellations available that lead to similar levels of market acceptance, which is good news. Lastly, as not all

[23] It should be kept in mind that there were also some project attribute levels that negatively impacted both a project's choice or rating. For small city residents: solar vignette (reimbursement), skiing area (location). For rurals: solar vignette, investment in developing countries (reimbursement), farm, skiing area (location), large company (provider). None for big city residents.

project attribute levels were similarly popular in all places of living, providers might have to adapt their projects to fulfill the needs of their intended target group (as was also suggested by van den Berg and Tempels (2022)).

In summary, by considering all of these findings, it seems to remain unclear whether shared PV projects can actually unlock their full potential for residents in the area where they might theoretically be most auspicious—those living in the cities. But overall, this study managed to contribute to research by uncovering socially-accepted shared PV project design, thus adding to evidence from other scientific areas on this promising renewable energy source. This once again highlights the relevance of approaching such issues not only from a technical or economic but also a social science point of view to secure public support necessary for effective implementation.

4.3.1. Limitations

Of course, this study is not without limitations: For one, owed to the survey context and despite the conjoint's many merits, the setting remains hypothetical, and respondent's answers do not have any real-life implications such as having to truly invest their own money into a shared PV project (i.e. stated vs. revealed preferences). As observed for the diverging results regarding socio-political and market acceptance depending on place of living, social desirability might have biased these results to a certain and unknown degree. Two, as pointed out in section 2.1, results for rural–urban preferences for environmental policies or renewable energy drastically vary depending on the national (or even subnational) context. Since the above research question was only investigated in Switzerland, one would not presume to generalise these findings either. Three, linked to this last limitation, while the sample size was big overall, those for the four place-based subgroups were neither similarly large nor proportional to actual population distributions in Switzerland (e.g. rural = 1601, suburbs = 614, small city = 480, big city = 219). While none of these subsamples is problematically small or under-powered[24], the oversampling of rural residents might potentially have had consequences for the results obtained. This might also question the measurement of the used 'place of living'-variable. Because some research indicates that subjective and objective 'place of living'-measurements do not overlap very well (e.g. Nemerever and Rogers 2021, Hermann *et al* 2023), it is also something to keep in mind that a more objective measurement might have led to other outcomes. Further, other variables such as place-based identity or place-based attachment might have led to yet again other conclusions.

5. Conclusion

In order to answer the research question of how a respondent's place of living shapes their social acceptance of shared PV projects, data from the SWEET-EDGE project in Switzerland from fall 2022 was used. Overall, the previously presented and discussed findings have important implications: For one, and contrary to most research on the rural–urban-divide on environmental issues, this study was able to identify significant differences between various places of living in the sense that the effects of shared PV project acceptance do not run linearly along the rural–urban spectrum. More specifically, the fact that big city residents exhibited the highest level of socio-political acceptance but stated the lowest willingness to invest (market acceptance), and opposite results emerged for rural residents, shows that there seems to be an underlying factor which keeps more urban residents from putting their generally positive attitude towards shared PV projects into practice. Identifying this hindering factor is therefore of utmost importance. Also in regards to market acceptance, there were no factors that encouraged further investment for either 'place of living'-subgroup. In fact, analyses only identified project attribute levels that reduce the chosen amount of PV modules. This is still good news: As long as none of these factors are implemented, people are open to invest under various project constellations, which should be kept in mind when designing shared PV projects. Alternatively, more sensitisation is necessary to foster awareness and acceptance of certain project attribute levels. Attribute levels that were positively evaluated either by some or all places of living should be especially considered when designing a shared PV project in order to maximise project acceptance. In other words, adapting preferences to target groups might prove to be efficient.

Further avenues for research are therefore offered in regards to the 'place of living'-variable under question, where nuances in outcomes might appear. Future studies should also take the broader geographical context as well as the conditions surrounding these shared PV projects into account, for example by conducting country comparisons or by including other project attributes (e.g. the scale of a solar project, the

[24] The smallest subsample consisted of 207 respondents, which corresponds to a power of 0.75. This was determined using the 'cjpowR'-calculator by Freitag and Schuessler (2020).

country of production of the solar panels used or the (social and decisional) level of involvement and participation of investors). To ensure effective implementation, future research should also keep the multidisciplinary aspects in mind, i.e. combining technical and social aspects. Most importantly, such research might be able to identify why socio-political and market acceptance do not go hand in hand for the same place of living (urban or rural). If this is not a case of social desirability, other factors could be at play that could potentially explain why, at least so far, more urban residents are most hesitant to invest in shared PV projects. This is crucial because urban residents are seen as the target group where shared PV projects are assumed to have their biggest potential for expansion.

Data availability statement

The data that support the findings of this study will be openly available following an embargo at the following URL/DOI: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/OL3VHQ. Data will be available from 1 January 2025.

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Conflict of interest

The author declares to have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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Ethical statement

The study has been approved by the Ethics Commission of the ETH Zurich (EK 2022-N-109) and is in accordance with the Declaration of Helsinki. All participants consented to participate.

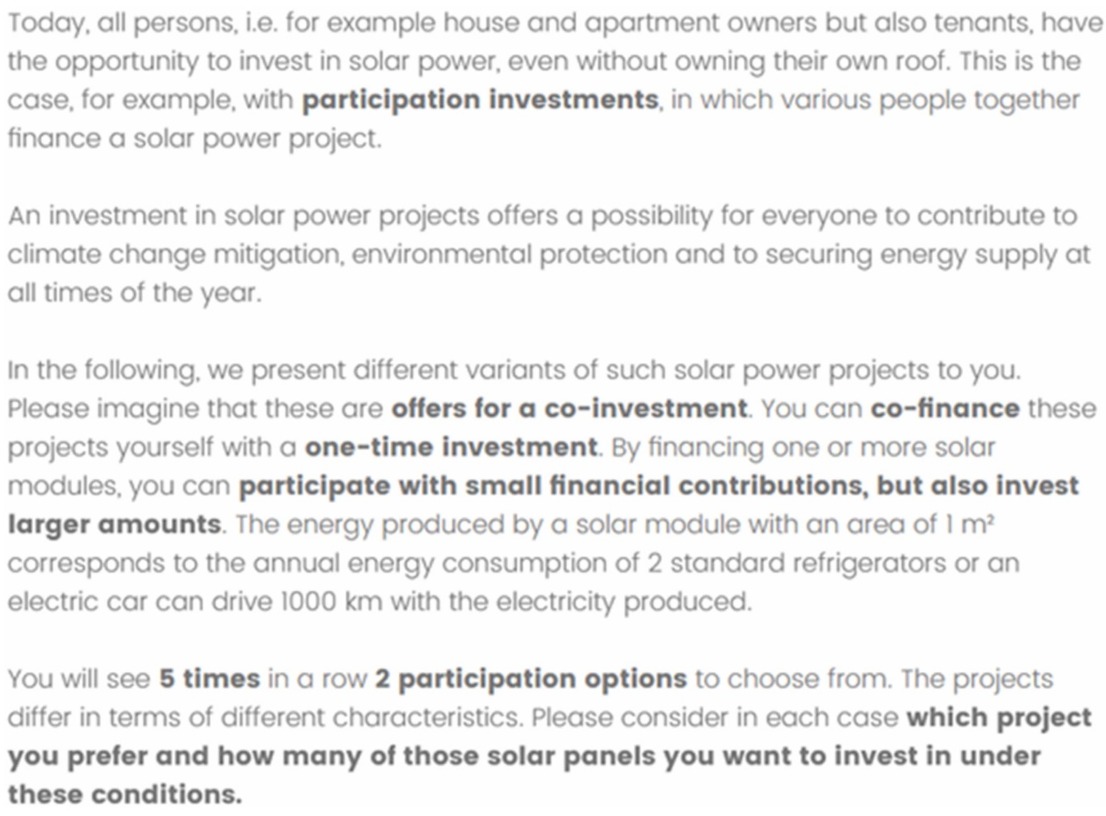
Appendix

A.1. Descriptives

Variable	Category	Rurals	Suburbs	Small city	Big city
Age category	18–30 years	210 (13.17%)	87 (14.45%)	83 (17.44%)	37 (17.05%)
	31–40 years	238 (14.92%)	95 (15.78%)	89 (18.70%)	53 (24.42%)
	41–50 years	322 (20.19%)	117 (19.44%)	81 (17.02%)	40 (18.43%)
	51–60 years	417 (26.14%)	159 (26.41%)	112 (23.53%)	43 (19.82%)
	61–70 years	314 (19.69%)	104 (17.28%)	75 (15.76%)	34 (15.67%)
	71–80 years	93 (5.83%)	40 (6.64%)	36 (7.56%)	10 (4.61%)
	over 80 years	1 (0.06%)	0 (0%)	0 (0%)	0 (0%)
Gender	female	737 (46.79%)	256 (42.38%)	225 (48.08%)	95 (44.19%)
	male	835 (53.02%)	346 (57.28%)	239 (51.07%)	118 (54.88%)
	other	3 (0.19%)	2 (0.33%)	4 (0.85%)	2 (0.93%)
Income category	under CHF 5000	263 (16.82%)	85 (14.33%)	93 (20.00%)	31 (14.49%)
	CHF 5001 to CHF 7000	376 (24.04%)	121 (20.40%)	105 (22.58%)	53 (24.77%)
	CHF 7001 to CHF 9000	329 (21.04%)	131 (22.09%)	89 (19.14%)	39 (18.22%)
	CHF 9001 to CHF 13 000	364 (23.27%)	146 (24.62%)	115 (24.73%)	50 (23.36%)
	over CHF 13 001	232 (14.83%)	110 (18.55%)	63 (13.55%)	41 (19.16%)
Education	Secondary I	77 (4.97%)	18 (3.03%)	26 (5.74%)	14 (6.54%)
	Secondary II	805 (51.97%)	279 (46.89%)	185 (40.84%)	48 (22.43%)
	Tertiary	667 (43.06%)	298 (50.08%)	242 (53.42%)	152 (71.03%)
Political orientation	Left	472 (29.52%)	223 (36.56%)	176 (36.74%)	126 (58.06%)
	Center	434 (27.14%)	177 (29.02%)	142 (29.65%)	47 (21.66%)
	Right	656 (41.03%)	199 (32.62%)	152 (31.73%)	40 (18.43%)
	None	37 (2.31%)	11 (1.80%)	9 (1.88%)	4 (1.84%)
Total respondents		1607 (55.03%)	614 (21.03%)	480 (16.44%)	219 (7.5%)

Data source: Stadelmann-Steffen *et al* (2022), own calculations.

A.2. Conjoint introduction



Today, all persons, i.e. for example house and apartment owners but also tenants, have the opportunity to invest in solar power, even without owning their own roof. This is the case, for example, with **participation investments**, in which various people together finance a solar power project.

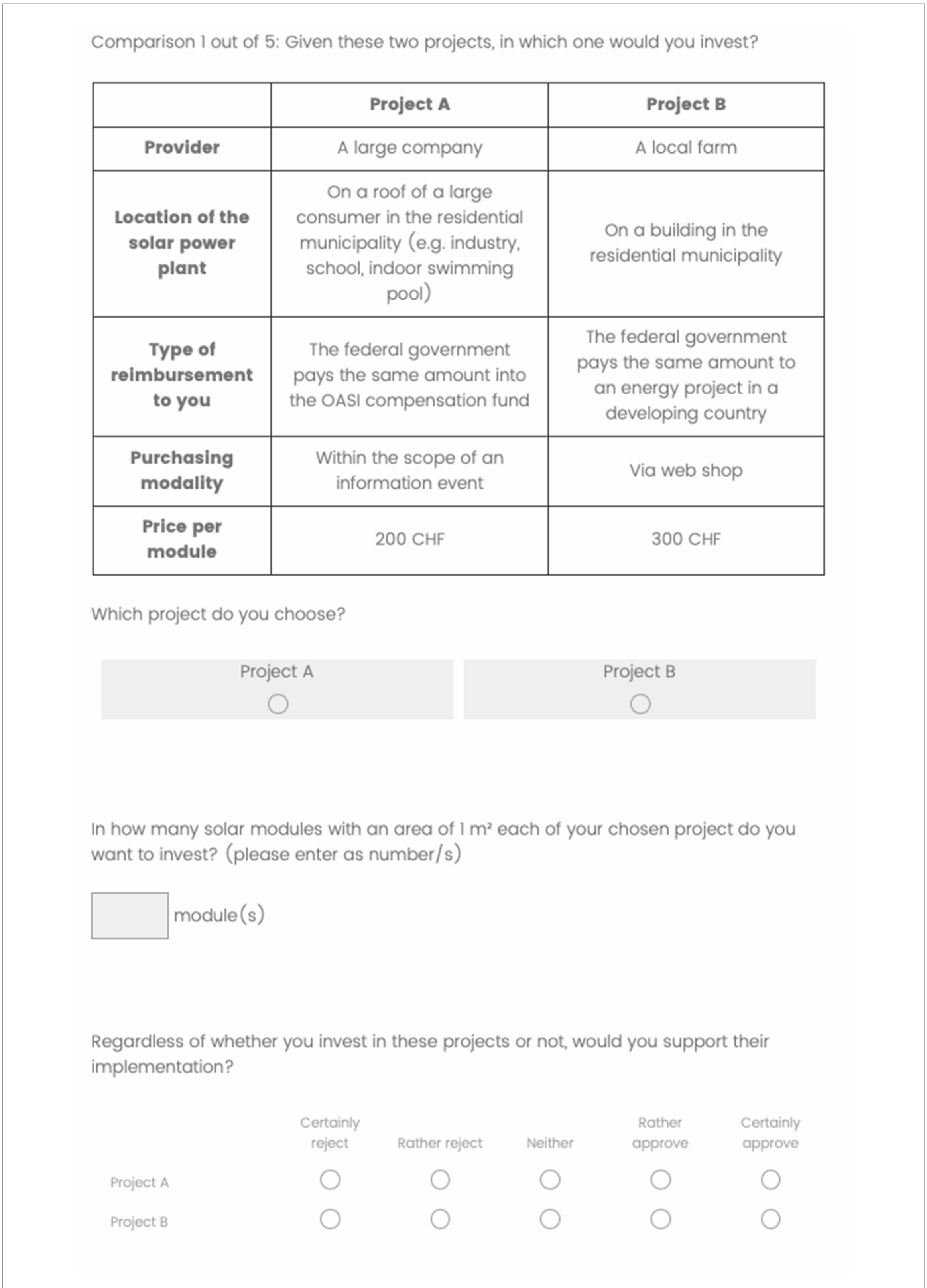
An investment in solar power projects offers a possibility for everyone to contribute to climate change mitigation, environmental protection and to securing energy supply at all times of the year.

In the following, we present different variants of such solar power projects to you. Please imagine that these are **offers for a co-investment**. You can **co-finance** these projects yourself with a **one-time investment**. By financing one or more solar modules, you can **participate with small financial contributions, but also invest larger amounts**. The energy produced by a solar module with an area of 1 m² corresponds to the annual energy consumption of 2 standard refrigerators or an electric car can drive 1000 km with the electricity produced.

You will see **5 times** in a row **2 participation options** to choose from. The projects differ in terms of different characteristics. Please consider in each case **which project you prefer and how many of those solar panels you want to invest in under these conditions.**

Figure 5. Conjoint introduction as presented to respondents. Reproduced from Brückmann *et al* (2024). CC BY 4.0.

A.3. Conjoint example



Comparison 1 out of 5: Given these two projects, in which one would you invest?

	Project A	Project B
Provider	A large company	A local farm
Location of the solar power plant	On a roof of a large consumer in the residential municipality (e.g. industry, school, indoor swimming pool)	On a building in the residential municipality
Type of reimbursement to you	The federal government pays the same amount into the OASI compensation fund	The federal government pays the same amount to an energy project in a developing country
Purchasing modality	Within the scope of an information event	Via web shop
Price per module	200 CHF	300 CHF

Which project do you choose?

Project A ○ Project B ○

In how many solar modules with an area of 1 m² each of your chosen project do you want to invest? (please enter as number/s)

module(s)

Regardless of whether you invest in these projects or not, would you support their implementation?

	Certainly reject	Rather reject	Neither	Rather approve	Certainly approve
Project A	○	○	○	○	○
Project B	○	○	○	○	○

Figure 6. Conjoint scenario as presented to respondents. Reproduced from Brückmann *et al* (2024). CC BY 4.0.

A.4. Mean test—project rating

	Big city ($P > \|t\|$)	Small city ($P > \|t\|$)	Suburbs ($P > \|t\|$)	Rural ($P > \|t\|$)
Big city ($P > \|t\|$)	3.782 65 ($<2 \times 10^{-16}$)	0.195 15 (6.07×10^{-11})	0.141 61 (8.70×10^{-7})	0.268 647 ($<2 \times 10^{-16}$)
Small city ($P > \|t\|$)	−0.195 15 (6.07×10^{-11})	3.587 50 ($<2 \times 10^{-16}$)	−0.053 54 (0.0163)	0.073 499 (0.000 112)
Suburbs ($P > \|t\|$)	−0.141 61 (8.70×10^{-7})	0.053 54 (0.016 255)	3.641 04 ($<2 \times 10^{-16}$)	0.127 041 (2.49×10^{-13})
Rural ($P > \|t\|$)	−0.268 65 ($<2 \times 10^{-16}$)	−0.073 50 (0.000 112)	−0.127 04 (2.49×10^{-13})	3.514 001 ($<2 \times -16$)

Note: This table reads as follows: The value of the cell where two identical places meet states the mean (of this place), the value in the other cells of this column state the deviation of the row-place from the column-place, thus indicating the row-place mean.
Reading example: The mean of 'big city' is 3.78. The value −0.195 indicates the deviance from the 'big city'-mean, resulting in a mean of 3.5875 for 'small city'. This mean is significantly different from the 'big city'-mean, indicated by the *p*-value of $<2 \times 10^{-16}$.

A.5. Marginal means—full sample

		Choice ($n = 2735$)			Rating ($n = 2927$)			Nr. of Modules ($n = 2735$)		
Attribute	Attribute level	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
Price	350	0.472	0.461	0.483	3.546	3.507	3.584	9.840	8.801	10.879
	300	0.505	0.494	0.516	3.564	3.525	3.603	9.450	8.613	10.286
	250	0.498	0.488	0.509	3.569	3.532	3.607	10.911	9.846	11.975
	200	0.524	0.513	0.535	3.610	3.572	3.648	11.188	10.192	12.184
Reimbursement	Investment in developing country	0.389	0.374	0.404	3.337	3.288	3.386	10.006	8.735	11.276
	OASI compensation	0.526	0.511	0.541	3.593	3.550	3.637	9.852	8.848	10.857
	Solar vignette	0.389	0.375	0.404	3.435	3.390	3.481	11.711	10.115	13.306
	Tax deduction	0.545	0.531	0.560	3.680	3.638	3.722	10.409	9.400	11.419
	Mobility voucher	0.510	0.496	0.525	3.598	3.553	3.643	9.643	8.641	10.644
	Credit voucher	0.630	0.616	0.643	3.788	3.748	3.828	10.733	9.743	11.722
Location	Skiing area	0.422	0.409	0.435	3.414	3.371	3.457	9.751	8.755	10.747
	Farm	0.438	0.425	0.451	3.507	3.465	3.549	10.948	9.815	12.081
	Large consumer roof	0.567	0.554	0.580	3.648	3.607	3.689	9.894	8.923	10.865
	Traffic infrastructure	0.575	0.562	0.587	3.684	3.645	3.724	10.574	9.640	11.509
	Communal building	0.494	0.481	0.507	3.606	3.566	3.647	10.672	9.627	11.716
Provider	Local farm	0.509	0.494	0.523	3.570	3.527	3.614	10.016	9.069	10.962
	Start-up	0.444	0.430	0.458	3.543	3.498	3.587	10.502	9.349	11.655
	Large company	0.431	0.417	0.445	3.491	3.448	3.534	10.634	9.417	11.852
	Solar plant's municipality	0.560	0.547	0.574	3.625	3.582	3.668	10.567	9.462	11.673
	Electricity provider	0.553	0.539	0.567	3.633	3.591	3.675	10.272	9.205	11.338
	Local club	0.504	0.490	0.518	3.572	3.529	3.615	10.264	9.091	11.437
Purchasing modality	Electronics purchase option	0.498	0.484	0.513	3.532	3.489	3.575	10.998	9.832	12.165
	Information event	0.515	0.501	0.530	3.574	3.530	3.617	10.083	8.927	11.238
	Web shop	0.482	0.468	0.496	3.572	3.528	3.616	10.367	9.284	11.450
	Retailer checkout	0.482	0.468	0.496	3.570	3.528	3.612	9.929	8.750	11.108
	Project manager meeting	0.522	0.508	0.535	3.604	3.561	3.647	10.121	9.115	11.128
	Project manager form	0.500	0.486	0.514	3.582	3.539	3.624	10.738	9.723	11.753

Note: Data from Stadelmann-Steffen *et al* (2022), own calculations. Full sample means: Choice = 0.5, Rating = 3.572, Number of Modules = 10.37.

A.6. Marginal means—project rating

	Rural ($n = 1599$)			Suburbs ($n = 610$)			Small city ($n = 479$)			Big city ($n = 217$)		
Attribute level	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
350	3.494	3.441	3.546	3.572	3.486	3.658	3.618	3.528	3.707	3.707	3.570	3.845
300	3.537	3.484	3.590	3.582	3.494	3.670	3.553	3.461	3.645	3.784	3.642	3.926
250	3.480	3.428	3.533	3.681	3.603	3.759	3.602	3.513	3.690	3.829	3.701	3.957
200	3.548	3.497	3.600	3.742	3.666	3.819	3.568	3.472	3.665	3.839	3.710	3.968
Investment in developing country	3.226	3.160	3.293	3.355	3.247	3.464	3.496	3.384	3.607	3.719	3.553	3.884
OASI compensation	3.529	3.470	3.587	3.705	3.612	3.798	3.609	3.505	3.713	3.748	3.583	3.912
Solar vignette	3.367	3.303	3.431	3.514	3.420	3.608	3.475	3.367	3.583	3.645	3.481	3.808
Tax deduction	3.643	3.587	3.700	3.752	3.657	3.846	3.651	3.550	3.753	3.853	3.716	3.989
Mobility voucher	3.556	3.494	3.618	3.672	3.574	3.770	3.562	3.458	3.667	3.813	3.650	3.976
Credit voucher	3.757	3.703	3.812	3.867	3.779	3.955	3.736	3.636	3.837	3.953	3.825	4.080
Skiing area	3.365	3.306	3.424	3.468	3.375	3.561	3.421	3.319	3.523	3.650	3.511	3.790
Farm	3.443	3.385	3.500	3.593	3.498	3.687	3.531	3.436	3.625	3.696	3.560	3.832
Large consumer roof	3.597	3.541	3.653	3.763	3.679	3.847	3.586	3.481	3.691	3.875	3.737	4.012
Traffic infrastructure	3.628	3.575	3.681	3.754	3.668	3.840	3.717	3.621	3.812	3.864	3.707	4.020
Communal building	3.537	3.481	3.594	3.661	3.575	3.747	3.662	3.569	3.756	3.852	3.718	3.987
Local farm	3.513	3.452	3.574	3.630	3.539	3.721	3.570	3.476	3.664	3.882	3.732	4.033
Start-up	3.469	3.406	3.531	3.662	3.570	3.754	3.526	3.418	3.634	3.777	3.643	3.911
Large company	3.408	3.348	3.467	3.594	3.511	3.678	3.512	3.405	3.619	3.743	3.581	3.905
Solar plant's municipality	3.568	3.510	3.626	3.658	3.557	3.758	3.710	3.607	3.812	3.838	3.698	3.978
Electricity provider	3.604	3.546	3.662	3.684	3.593	3.776	3.616	3.521	3.711	3.802	3.652	3.951
Local club	3.524	3.465	3.584	3.648	3.554	3.741	3.580	3.474	3.686	3.702	3.549	3.855
Electronics purchase option	3.465	3.407	3.523	3.615	3.520	3.709	3.597	3.501	3.693	3.684	3.505	3.862
Information event	3.519	3.459	3.579	3.641	3.551	3.732	3.567	3.456	3.678	3.846	3.712	3.981
Web shop	3.542	3.482	3.602	3.613	3.514	3.712	3.554	3.448	3.661	3.754	3.604	3.905
Retailer checkout	3.499	3.442	3.557	3.654	3.562	3.747	3.576	3.471	3.682	3.831	3.685	3.977
Project manager meeting	3.542	3.484	3.600	3.698	3.601	3.794	3.623	3.518	3.728	3.779	3.609	3.948
Project manager form	3.521	3.461	3.580	3.651	3.565	3.738	3.595	3.494	3.697	3.834	3.682	3.986

Data source: Stadelmann-Steffen *et al* (2022), own calculations.

A.7. Differences in MM—project rating

Attribute	Attribute level	Small city ($n = 479$)			Suburbs ($n = 610$)			Rural ($n = 1599$)		
		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
Price	350	−0.090	−0.254	0.074	−0.135	−0.297	0.027	−0.214	−0.361	−0.067
	300	−0.231	−0.400	−0.062	−0.202	−0.369	−0.035	−0.247	−0.398	−0.095
	250	−0.228	−0.383	−0.072	−0.148	−0.298	0.002	−0.349	−0.487	−0.211
	200	−0.271	−0.431	−0.110	−0.097	−0.246	0.053	−0.291	−0.429	−0.152
Reimbursement	Investment in developing country	−0.223	−0.422	−0.023	−0.363	−0.561	−0.165	−0.492	−0.671	−0.314
	OASI compensation	−0.139	−0.334	0.056	−0.043	−0.232	0.146	−0.219	−0.394	−0.044
	Solar vignette	−0.169	−0.365	0.027	−0.130	−0.319	0.059	−0.278	−0.454	−0.102
	Tax deduction	−0.201	−0.371	−0.032	−0.101	−0.267	0.065	−0.209	−0.357	−0.062
	Mobility voucher	−0.251	−0.444	−0.057	−0.141	−0.331	0.049	−0.257	−0.431	−0.083
	Credit voucher	−0.216	−0.378	−0.054	−0.085	−0.240	0.069	−0.195	−0.334	−0.057
Location	Skiing area	−0.229	−0.402	−0.056	−0.182	−0.350	−0.015	−0.285	−0.437	−0.134
	Farm	−0.165	−0.331	0.001	−0.103	−0.269	0.063	−0.253	−0.401	−0.105
	Large consumer roof	−0.289	−0.462	−0.116	−0.111	−0.273	0.050	−0.277	−0.426	−0.129
	Traffic infrastructure	−0.147	−0.330	0.036	−0.110	−0.288	0.069	−0.236	−0.401	−0.070
	Communal building	−0.190	−0.354	−0.026	−0.191	−0.351	−0.031	−0.315	−0.461	−0.169
Provider	Local farm	−0.312	−0.490	−0.135	−0.252	−0.428	−0.076	−0.369	−0.532	−0.207
	Start—up	−0.251	−0.423	−0.078	−0.115	−0.278	0.048	−0.308	−0.456	−0.160
	Large company	−0.231	−0.426	−0.037	−0.149	−0.331	0.034	−0.336	−0.508	−0.163
	Solar plant’s municipality	−0.128	−0.302	0.046	−0.180	−0.352	−0.007	−0.270	−0.422	−0.118
	Electricity provider	−0.186	−0.362	−0.009	−0.117	−0.293	0.058	−0.198	−0.358	−0.037
	Local club	−0.122	−0.308	0.064	−0.055	−0.234	0.125	−0.178	−0.342	−0.014
Purchasing modality	Electronics purchase option	−0.086	−0.289	0.117	−0.069	−0.271	0.133	−0.219	−0.407	−0.031
	Information event	−0.279	−0.454	−0.105	−0.205	−0.367	−0.043	−0.327	−0.474	−0.180
	Web shop	−0.200	−0.385	−0.015	−0.142	−0.322	0.039	−0.212	−0.375	−0.050
	Retailer checkout	−0.254	−0.434	−0.074	−0.177	−0.349	−0.004	−0.331	−0.488	−0.175
	Project manager meeting	−0.156	−0.355	0.044	−0.081	−0.276	0.114	−0.237	−0.416	−0.058
	Project manager form	−0.238	−0.421	−0.056	−0.182	−0.357	−0.007	−0.313	−0.476	−0.150

Data source: Stadelmann-Steffen *et al* (2022), own calculations.
Note: Displayed are the differences in MM relative to the ‘big city’-category ($n = 217$).

A.8. Marginal means—project choice

	Rural ($n = 1483$)			Suburbs ($n = 581$)			Small city ($n = 445$)			Big city ($n = 207$)		
Attribute level	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
350	0.477	0.462	0.492	0.450	0.426	0.474	0.496	0.469	0.523	0.453	0.413	0.493
300	0.512	0.497	0.526	0.493	0.470	0.516	0.491	0.463	0.519	0.510	0.471	0.548
250	0.490	0.475	0.505	0.509	0.487	0.530	0.510	0.483	0.537	0.507	0.469	0.545
200	0.522	0.507	0.536	0.546	0.522	0.569	0.502	0.475	0.529	0.534	0.490	0.577
Investment in developing country	0.367	0.347	0.387	0.385	0.351	0.419	0.435	0.399	0.471	0.453	0.395	0.510
OASI compensation	0.531	0.511	0.551	0.517	0.484	0.550	0.527	0.492	0.561	0.504	0.448	0.559
Solar vignette	0.388	0.369	0.408	0.389	0.357	0.422	0.410	0.373	0.446	0.350	0.299	0.400
Tax deduction	0.561	0.541	0.580	0.524	0.491	0.556	0.535	0.498	0.572	0.519	0.460	0.577
Mobility voucher	0.510	0.490	0.530	0.525	0.495	0.556	0.487	0.450	0.524	0.536	0.481	0.590
Credit voucher	0.627	0.609	0.645	0.645	0.616	0.675	0.614	0.578	0.650	0.637	0.587	0.688
Skiing area	0.425	0.407	0.443	0.427	0.399	0.455	0.387	0.353	0.422	0.473	0.424	0.522
Farm	0.454	0.436	0.472	0.428	0.400	0.456	0.414	0.381	0.447	0.388	0.344	0.433
Large consumer roof	0.564	0.547	0.581	0.579	0.550	0.608	0.579	0.547	0.612	0.534	0.491	0.577
Traffic infrastructure	0.565	0.548	0.582	0.588	0.561	0.615	0.589	0.559	0.619	0.579	0.535	0.623
Communal building	0.487	0.469	0.505	0.480	0.452	0.507	0.524	0.492	0.555	0.529	0.487	0.571
Local farm	0.512	0.493	0.532	0.506	0.476	0.536	0.501	0.465	0.537	0.507	0.453	0.560
Start-up	0.438	0.419	0.457	0.446	0.416	0.475	0.439	0.403	0.476	0.490	0.444	0.536
Large company	0.419	0.399	0.439	0.445	0.415	0.476	0.446	0.410	0.483	0.447	0.400	0.495
Solar plant's municipality	0.570	0.551	0.588	0.542	0.511	0.573	0.564	0.529	0.600	0.535	0.487	0.584
Electricity provider	0.555	0.536	0.575	0.547	0.516	0.577	0.562	0.524	0.600	0.535	0.485	0.585
Local club	0.502	0.483	0.521	0.521	0.492	0.551	0.490	0.455	0.524	0.487	0.439	0.534
Electronics purchase option	0.494	0.475	0.513	0.499	0.467	0.530	0.521	0.485	0.558	0.475	0.415	0.534
Information event	0.525	0.506	0.545	0.503	0.473	0.534	0.492	0.458	0.526	0.526	0.475	0.578
Web shop	0.475	0.456	0.494	0.491	0.460	0.522	0.488	0.451	0.525	0.490	0.435	0.544
Retailer checkout	0.481	0.462	0.500	0.485	0.456	0.513	0.479	0.445	0.513	0.484	0.429	0.539
Project manager meeting	0.525	0.506	0.544	0.515	0.485	0.544	0.524	0.488	0.559	0.514	0.465	0.562
Project manager form	0.498	0.479	0.516	0.508	0.478	0.539	0.496	0.462	0.531	0.505	0.453	0.557

Data source: Stadelmann-Steffen *et al* (2022), own calculations.

A.9. Differences in MM—project choice

		Small city ($n = 445$)			Suburbs ($n = 581$)			Rural ($n = 1483$)		
Attribute	Attribute level	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
Price	350	0.043	−0.005	0.091	−0.003	−0.050	0.044	0.024	−0.019	0.067
	300	−0.019	−0.066	0.029	−0.017	−0.062	0.028	0.002	−0.039	0.043
	250	0.003	−0.044	0.050	0.001	−0.042	0.045	−0.017	−0.058	0.024
	200	−0.032	−0.083	0.019	0.012	−0.037	0.061	−0.012	−0.058	0.034
Reimbursement	Investment in developing country	−0.018	−0.086	0.050	−0.068	−0.134	−0.001	−0.085	−0.146	−0.024
	OASI compensation	0.023	−0.043	0.089	0.014	−0.051	0.079	0.027	−0.032	0.087
	Solar vignette	0.060	−0.002	0.123	0.039	−0.021	0.099	0.039	−0.016	0.093
	Tax deduction	0.016	−0.053	0.085	0.005	−0.062	0.072	0.042	−0.020	0.104
	Mobility voucher	−0.049	−0.114	0.017	−0.010	−0.072	0.052	−0.026	−0.084	0.032
	Credit voucher	−0.023	−0.085	0.039	0.008	−0.050	0.066	−0.011	−0.064	0.043
Location	Skiing area	−0.086	−0.146	−0.026	−0.046	−0.103	0.011	−0.048	−0.100	0.004
	Farm	0.026	−0.029	0.081	0.039	−0.013	0.092	0.066	0.018	0.113
	Large consumer roof	0.045	−0.008	0.099	0.045	−0.007	0.097	0.030	−0.017	0.076
	Traffic infrastructure	0.010	−0.043	0.063	0.009	−0.043	0.061	−0.014	−0.061	0.033
	Communal building	−0.005	−0.058	0.047	−0.049	−0.100	0.001	−0.042	−0.088	0.004
Provider	Local farm	−0.006	−0.070	0.058	−0.001	−0.062	0.060	0.006	−0.051	0.062
	Start—up	−0.051	−0.109	0.008	−0.044	−0.098	0.011	−0.052	−0.102	−0.002
	Large company	−0.001	−0.061	0.059	−0.002	−0.059	0.054	−0.028	−0.080	0.023
	Solar plant's municipality	0.029	−0.032	0.089	0.006	−0.052	0.064	0.034	−0.018	0.086
	Electricity provider	0.027	−0.035	0.089	0.012	−0.046	0.070	0.020	−0.033	0.074
	Local club	0.003	−0.056	0.062	0.035	−0.022	0.091	0.015	−0.036	0.067
Purchasing modality	Electronics purchase option	0.047	−0.023	0.116	0.024	−0.043	0.091	0.019	−0.044	0.082
	Information event	−0.035	−0.096	0.027	−0.023	−0.083	0.037	−0.001	−0.056	0.054
	Web shop	−0.001	−0.067	0.065	0.001	−0.061	0.064	−0.014	−0.072	0.043
	Retailer checkout	−0.005	−0.070	0.059	0.000	−0.061	0.062	−0.003	−0.061	0.055
	Project manager meeting	0.010	−0.050	0.070	0.001	−0.056	0.058	0.011	−0.041	0.064
	Project manager form	−0.008	−0.071	0.054	0.004	−0.056	0.064	−0.007	−0.062	0.048

Data source: Stadelmann-Steffen *et al* (2022), own calculations.
Note: Displayed are the differences in MM relative to the 'big city'-category ($n = 207$).

A.10. Mean test—number of modules

	Big city ($P > \|t\|$)	Small city ($P > \|t\|$)	Suburbs ($P > \|t\|$)	Rural ($P > \|t\|$)
Big city ($P > \|t\|$)	8.1131 ($<2 \times 10^{-16}$)	−1.1287 (0.168 158)	−3.4655 (1.03×10^{-5})	−2.4110 (0.000 841)
Small city ($P > \|t\|$)	1.1287 (0.168 158)	9.2418 ($<2 \times 10^{-16}$)	−2.3368 (0.000 125)	−1.2823 (0.014 522)
Suburbs ($P > \|t\|$)	3.4655 (1.03×10^{-5})	2.3368 (0.000 125)	11.5787 ($<2 \times 10^{-16}$)	1.0545 (0.025 037)
Rural ($P > \|t\|$)	2.4110 (0.000 841)	1.2823 (0.014 522)	−1.0545 (0.025 037)	10.5242 ($<2 \times 10^{-16}$)

Note: This table reads as follows: The value of the cell where two identical places meet states the mean (of this place), the value in the other cells of this column state the deviation of the row-place from the column-place, thus indicating the row-place mean.
Reading example: The mean of 'big city' is 8.11. The value 1.1287 indicates the deviance from the 'big city'-mean, resulting in a mean of 9.24 for 'small city'. This mean is not significantly different from the 'big city'-mean, indicated by the p-value of 0.168 158.

A.11. Marginal means—number of modules

	Rural ($n = 1483$)			Suburbs ($n = 581$)			Small city ($n = 445$)			Big city ($n = 207$)		
Attribute level	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
350	10.274	8.691	11.858	11.621	9.334	13.909	7.690	6.120	9.260	6.788	4.127	9.449
300	9.687	8.550	10.824	9.785	7.850	11.720	8.867	6.910	10.823	7.716	4.886	10.545
250	10.437	9.190	11.685	12.377	9.767	14.987	10.507	7.775	13.238	11.080	6.083	16.076
200	11.508	10.061	12.955	12.551	10.391	14.712	9.825	7.728	11.922	6.726	5.131	8.321
Investment in developing country	10.680	8.700	12.660	10.328	7.880	12.776	9.344	6.512	12.176	7.036	4.609	9.463
OASI compensation	9.285	8.019	10.551	10.773	8.684	12.862	10.003	7.343	12.662	9.407	4.488	14.326
Solar vignette	11.482	9.302	13.662	13.783	9.831	17.736	11.220	7.629	14.810	7.632	3.997	11.266
Tax deduction	10.346	8.978	11.714	12.185	9.950	14.419	9.952	7.207	12.697	6.516	4.653	8.379
Mobility voucher	10.018	8.638	11.398	10.487	8.183	12.792	8.213	6.102	10.324	7.908	4.287	11.528
Credit voucher	11.212	9.787	12.638	12.193	10.021	14.365	7.392	6.068	8.717	9.768	5.934	13.602
Skiing area	9.713	8.366	11.060	10.345	8.320	12.369	11.173	7.900	14.447	5.656	4.412	6.900
Farm	11.613	9.961	13.264	12.769	10.307	15.231	8.132	5.946	10.317	6.680	3.794	9.566
Large consumer roof	9.304	8.242	10.366	11.734	8.831	14.637	9.161	6.899	11.422	10.217	6.474	13.960
Traffic infrastructure	11.098	9.738	12.459	11.234	9.247	13.220	9.256	7.298	11.213	8.029	5.191	10.867
Communal building	10.734	9.260	12.207	12.163	9.883	14.443	8.925	6.604	11.246	9.231	5.964	12.499
Local farm	10.396	9.034	11.757	11.004	8.922	13.086	8.586	6.499	10.672	7.234	4.828	9.640
Start-up	10.813	9.209	12.417	12.015	9.186	14.844	8.703	6.465	10.940	7.108	4.411	9.805
Large company	10.208	8.627	11.789	12.511	9.597	15.424	9.278	6.590	11.965	11.088	6.251	15.925
Solar plant's municipality	10.608	9.063	12.153	11.786	9.315	14.257	10.228	7.564	12.891	7.639	4.940	10.337
Electricity provider	10.159	8.763	11.554	11.942	9.712	14.173	9.515	6.923	12.107	8.391	2.954	13.828
Local club	10.735	8.918	12.552	10.662	8.539	12.786	9.003	6.704	11.302	7.966	4.833	11.099
Electronics purchase option	11.346	9.819	12.873	11.782	8.997	14.567	9.099	6.522	11.676	10.915	5.781	16.050
Information event	10.847	9.040	12.654	10.237	8.156	12.318	8.748	6.770	10.725	6.274	4.493	8.054
Web shop	10.811	9.327	12.296	13.172	10.195	16.150	6.665	5.195	8.134	7.190	5.000	9.381
Retailer checkout	9.578	7.971	11.184	11.525	9.175	13.876	8.570	5.484	11.656	10.362	5.456	15.268
Project manager meeting	9.976	8.654	11.298	10.571	8.608	12.535	11.572	8.245	14.899	6.941	4.350	9.532
Project manager form	10.380	9.047	11.713	12.546	10.295	14.798	10.631	7.962	13.299	8.094	4.375	11.814

Data source: Stadelmann-Steffen *et al* (2022), own calculations.

A.12. Differences in MM—number of modules

		Small city ($n = 445$)			Suburbs ($n = 581$)			Rural ($n = 1483$)		
Attribute	Attribute level	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
Price	350	0.902	−2.187	3.991	4.833	1.325	8.342	3.486	0.390	6.583
	300	1.151	−2.289	4.591	2.070	−1.358	5.497	1.971	−1.078	5.021
	250	−0.573	−6.267	5.121	1.297	−4.340	6.935	−0.642	−5.792	4.507
	200	3.099	0.465	5.734	5.825	3.140	8.511	4.782	2.628	6.936
Reimbursement	Investment in developing country	2.308	−1.421	6.038	3.292	−0.155	6.739	3.644	0.512	6.776
	OASI compensation	0.596	−4.996	6.187	1.366	−3.978	6.710	−0.122	−5.201	4.957
	Solar vignette	3.588	−1.521	8.697	6.152	0.782	11.522	3.851	−0.387	8.089
	Tax deduction	3.436	0.118	6.753	5.669	2.759	8.578	3.830	1.519	6.141
	Mobility voucher	0.306	−3.885	4.497	2.580	−1.712	6.871	2.111	−1.764	5.985
Location	Credit voucher	−2.375	−6.432	1.681	2.425	−1.981	6.831	1.445	−2.646	5.535
	Skiing area	5.517	2.015	9.019	4.689	2.312	7.065	4.057	2.223	5.891
	Farm	1.452	−2.168	5.072	6.089	2.296	9.882	4.933	1.608	8.258
	Large consumer roof	−1.056	−5.429	3.316	1.517	−3.220	6.253	−0.913	−4.804	2.977
	Traffic infrastructure	1.227	−2.221	4.675	3.205	−0.259	6.669	3.070	−0.078	6.217
	Communal building	−0.306	−4.314	3.702	2.932	−1.053	6.916	1.503	−2.082	5.087
Provider	Local farm	1.352	−1.833	4.536	3.771	0.589	6.952	3.162	0.398	5.926
	Start−up	1.595	−1.909	5.099	4.907	0.998	8.816	3.705	0.568	6.843
	Large company	−1.811	−7.344	3.723	1.422	−4.224	7.069	−0.880	−5.969	4.208
	Solar plant's municipality	2.589	−1.202	6.381	4.147	0.488	7.807	2.970	−0.140	6.079
	Electricity provider	1.124	−4.900	7.147	3.551	−2.326	9.428	1.767	−3.846	7.381
	Local club	1.037	−2.849	4.923	2.697	−1.088	6.481	2.770	−0.852	6.391
Purchasing modality	Electronics purchase option	−1.816	−7.562	3.929	0.866	−4.975	6.708	0.431	−4.926	5.788
	Information event	2.474	−0.187	5.135	3.963	1.225	6.702	4.573	2.036	7.110
	Web shop	−0.526	−3.163	2.112	5.982	2.286	9.679	3.621	0.975	6.267
	Retailer checkout	−1.793	−7.589	4.003	1.163	−4.277	6.603	−0.784	−5.947	4.378
	Project manager meeting	4.631	0.414	8.848	3.630	0.379	6.881	3.035	0.126	5.944
	Project manager form	2.536	−2.041	7.114	4.452	0.104	8.800	2.286	−1.666	6.237

Data source: Stadelmann-Steffen *et al* (2022), own calculations.
Note: Displayed are the differences in MM relative to the 'big city'-category ($n = 207$).

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References

Ambrosius J D and Gilderbloom J I 2015 Who's greener? Comparing urban and suburban residents' environmental behaviour and concern *Local Environ.* **20** 836–49
Ammann K 2023 *Bericht zur Energiepolitik—IEA fordert Liberalisierung des Schweizer Strommarktes* (available at: www.srf.ch/news/schweiz/bericht-zur-energiepolitik-iea-fordert-liberalisierung-des-schweizer-strommarktes) (Accessed 23 May 2024)
Auspurg K and Hinz T 2014 *Factorial Survey Experiments* vol 175 (Sage Publications)
Azarova V, Cohen J, Friedl C and Reichl J 2019 Designing local renewable energy communities to increase social acceptance: evidence from a choice experiment in Austria, Germany, Italy and Switzerland *Energy Policy* **132** 1176–83
Bansak K, Hainmueller J, Hopkins D J and Yamamoto T 2021 Beyond the breaking point? Survey satisficing in conjoint experiments *Polit. Sci. Res. Methods* **9** 53–71
Batel S 2020 Research on the social acceptance of renewable energy technologies: past, present and future *Energy Res. Soc. Sci.* **68** 101544
Beiser-McGrath L F and Bernauer T 2019 Could revenue recycling make effective carbon taxation politically feasible? *Sci. Adv.* **5** eaax3323
Berenguer J, Corraliza J A and Martín R 2005 Rural-urban differences in environmental concern, attitudes and actions *Eur. J. Psychol. Assess.* **21** 128–38
Bergmann A, Colombo S and Hanley N 2008 Rural versus urban preferences for renewable energy developments *Ecol. Econ.* **65** 616–25
Bertsch V, Hall M, Weinhardt C and Fichtner W 2016 Public acceptance and preferences related to renewable energy and grid expansion policy: empirical insights for Germany *Energy* **114** 465–77
Bloem S, Swilling M and Koranteng K 2021 Taking energy democracy to the streets: socio-technical learning, institutional dynamism and integration in South African community energy projects *Energy Res. Soc. Sci.* **72** 101906
Brookes K and Cappellina B 2023 Political behaviour in France: the impact of the rural–urban divide *Fr. Politics* **21** 104–24

Brückmann G, Ruprecht S and Stadelmann-Steffen I 2024 Involving tenants in citizen-financed PV projects - an analysis of conjoint and framing experiments in Switzerland *Energy Res. Soc. Sci.* (submitted)
Brückmann G, Willibald F and Blanco V 2021 Battery electric vehicle adoption in regions without strong policies *Transp. Res.* D **90** 102615
Brügge C, Gomm S, Quoß F, Wäger P, Wehrli S, Linder J, Maissen P, Pahls H, Walker L and Bernauer T 2023 *Schweizer Umweltpanel. Zehnte Basisbefragung: Umwelteinstellungen, Umweltverhalten und umweltpolitische Präferenzen in der Schweiz* (available at: www.research-collection.ethz.ch/bitstream/handle/20.500.11850/662383/report_w10.pdf?sequence = 8&isAllowed = y) (Accessed 26 March 2024)
Carlisle J E, Kane S L, Solan D and Joe J C 2014 Support for solar energy: examining sense of place and utility-scale development in California *Energy Res. Soc. Sci.* **3** 124–30
Chan G, Evans I, Grimley M, Ihde B and Mazumder P 2017 Design choices and equity implications of community shared solar *Electr. J.* **30** 37–41
Cousse J 2021 Still in love with solar energy? Installation size, affect and the social acceptance of renewable energy technologies *Renew. Sustain. Energy Rev.* **145** 111107
Cousse J, Wüstenhagen R and Schneider N 2020 Mixed feelings on wind energy: affective imagery and local concern driving social acceptance in Switzerland *Energy Res. Soc. Sci.* **70** 101676
Curtin J, McInerney C, Gallachoir B O and Salm S 2019 Energizing local communities—what motivates Irish citizens to invest in distributed renewables? *Energy Res. Soc. Sci.* **48** 177–88
De Marco A, Petrosillo I, Semeraro T, Pasimeni M R, Aretano R and Zurlini G 2014 The contribution of utility-scale solar energy to the global climate regulation and its effects on local ecosystem services *Glob. Ecol. Conserv.* **2** 324–37
Duron-Ramos M F, Collado S, Garcia-Vasquez F I and Bello-Echeverria M 2020 The role of urban/rural environments on Mexican children's connection to nature and pro-environmental behavior *Front Psychol.* **11** 514
Elinder M and Jordahl H 2013 Political preferences and public sector outsourcing *Eur. J. Polit. Econ.* **30** 43–57
Federal Department of Foreign Affairs 2021 Renewable energy (available at: www.eda.admin.ch/aboutswitzerland/en/home/wirtschaft/energie/die-erneuerbaren-energien.html) (Accessed 29 March 2024)
Federal Statistical Office 2019 Nationalratswahlen: Stärke der Parteien nach Sprachregion und nach Siedlungstyp (available at: www.bfs.admin.ch/bfs/en/home/statistics/catalogues-databases.assetdetail.11048455.html) (Accessed 27 March 2024)
Federal Statistical Office 2024a Räumliche Typologien (available at: www.bfs.admin.ch/bfs/de/home/statistiken/querschnittsthemen/raeumliche-analysen/raeumliche-gliederungen/raeumliche-typologien.html) (Accessed 26 March 2024)
Federal Statistical Office 2024b Verteilung des verfügbaren Äquivalenzeinkommens und das Quintilverhältnis S80/S20, nach verschiedenen soziodemografischen Merkmalen (available at: www.bfs.admin.ch/bfs/en/home/statistics/economic-social-situation-population/economic-and-social-situation-of-the-population/inqualities-income-ditribution/income-distribution.assetdetail.30526413.html) (Accessed 28 March 2024)
Fleischhacker A, Lettner G, Schwabeneder D and Auer H 2019 Portfolio optimization of energy communities to meet reductions in costs and emissions *Energy* **173** 1092–105
Freitag M and Schuessler J 2020 cjpowR—a priori power analyses for conjoint experiments (available at: https://markusfreitag.shinyapps.io/cjpowr/) (Accessed 21 May 2024)
Fremstad A, Mildenberger M, Paul M and Stadelmann-Steffen I 2022 The role of rebates in public support for carbon taxes *Environ. Res. Lett.* **17** 084040
García del Horno R, Rico G and Hernández E 2023 Do they feel like they don't matter? The rural-urban divide in external political efficacy *West Eur. Polit.* **46** 1–26
Gjorgievski V Z, Cundeva S and Georghiou G E 2021 Social arrangements, technical designs and impacts of energy communities: a review *Renew. Energy* **169** 1138–56
Goedkoop F and Devine-Wright P 2016 Partnership or placation? The role of trust and justice in the shared ownership of renewable energy projects *Energy Res. Soc. Sci.* **17** 135–46
Goodhart D 2017 *The Road to Somewhere: The Populist Revolt and the Future of Politics* (C. Hurst & Company)
Hafez A, Nassar Y, Hammdan M and Alsadi S Y 2020 Technical and economic feasibility of utility-scale solar energy conversion systems in Saudi Arabia *Iran. J. Sci. Technol. - Trans. Electr. Eng.* **44** 213–25
Hainmueller J, Hangartner D and Yamamoto T 2015 Validating vignette and conjoint survey experiments against real-world behavior *Proc. Natl Acad. Sci. USA* **112** 2395–400
Hainmueller J, Hopkins D J and Yamamoto T 2014 Causal inference in conjoint analysis: understanding multidimensional choices via stated preference experiments *Polit. Anal.* **22** 1–30
Halleck Vega S, van Leeuwen E and van Twillert N 2022 Uptake of residential energy efficiency measures and renewable energy: do spatial factors matter? *Energy Policy* **160** 112659
Hammerle M, Best R and Crosby P 2021 Public acceptance of carbon taxes in Australia *Energy Econ.* **101** 105420
Hegewald S 2023 Locality as a safe haven: place-based resentment and political trust in local and national institutions *J. Eur. Public Policy* **31** 1–26
Herche W 2017 Solar energy strategies in the U.S. utility market *Renew. Sustain. Energy Rev.* **77** 590–5
Hermann M, Bühler G and Wenger V 2021 Stadt-Land-Monitor 2021 (available at: https://sotomo.ch/site/wp-content/uploads/2021/12/Stadt-Land-Monitor-2021.pdf) (Accessed 26 March 2024)
Hermann M, John A and Wenger V 2023 Stadt-Land-Monitor 2023 (available at: https://sotomo.ch/site/wp-content/uploads/2023/03/Stadt_Land_Monitor_2023_DE.pdf) (Accessed 26 March 2024)
Hernandez R *et al* 2014 Environmental impacts of utility-scale solar energy *Renew. Sustain. Energy Rev.* **29** 766–79
Hille S L, Curtius H C and Wüstenhagen R 2018 Red is the new blue—the role of color, building integration and country-of-origin in homeowners' preferences for residential photovoltaics *Energy Build.* **162** 21–31
Hornuf L, Stenzhorn E and Vintis T 2022 Are sustainability-oriented investors different? Evidence from equity crowdfunding *J. Technol. Transf.* **47** 1662–89
Hossain M and Oparaocha G O 2017 Crowdfunding: motives, definitions, typology and ethical challenges *Entrep. Res. J.* **7** 20150045
Kalkbrenner B J and Roosen J 2016 Citizens' willingness to participate in local renewable energy projects: the role of community and trust in Germany *Energy Res. Soc. Sci.* **13** 60–70
Kim K J, Lee H and Koo Y 2020 Research on local acceptance cost of renewable energy in South Korea: a case study of photovoltaic and wind power projects *Energy Policy* **144** 111684

Larson E C and Krannich R S 2016 “A great idea, just not near me!” understanding public attitudes about renewable energy facilities *Soc. Nat. Resour.* **29** 1436–51
Lee H-J, Huh S-Y and Yoo S-H 2018 Social preferences for small-scale solar photovoltaic power plants in South Korea: a choice experiment study *Sustainability* **10** 3589
Leeper T J 2020 Cregg: simple conjoint analyses and visualization. R package version 0.3.6 (available at: https://cran.r-project.org/web//packages/cregg/cregg.pdf)
Leeper T J, Hobolt S B and Tilley J 2020 Measuring subgroup preferences in conjoint experiments *Polit. Anal.* **28** 207–21
Li W, Long R, Chen H, Dou B, Chen F, Zheng X and He Z 2020 Public preference for electric vehicle incentive policies in China: a conjoint analysis *Int. J. Environ. Res. Public Health* **17** 318
Liebe U, Bartczak A and Meyerhoff J 2017 A turbine is not only a turbine: the role of social context and fairness characteristics for the local acceptance of wind power *Energy Policy* **107** 300–8
Liebe U and Dobers G M 2019 Decomposing public support for energy policy: what drives acceptance of and intentions to protest against renewable energy expansion in Germany? *Energy Res. Soc. Sci.* **47** 247–60
Lienhoop N 2018 Acceptance of wind energy and the role of financial and procedural participation: an investigation with focus groups and choice experiments *Energy Policy* **118** 97–105
Lipset S and Rokkan S 1967 *Party Systems and Voter Alignments: Cross-National Perspectives* (Free Press)
Mantegazzi D 2021 The geography of political ideologies in Switzerland over time *Spat. Econ. Anal.* **16** 378–96
Mehedi T H, Gemechu E and Kumar A 2022 Life cycle greenhouse gas emissions and energy footprints of utility-scale solar energy systems *Appl. Energy* **314** 118918
Nemerever Z and Rogers M 2021 Measuring the rural continuum in political science *Polit. Anal.* **29** 267–86
Nilson R S and Stedman R C 2022 Are big and small solar separate things?: the importance of scale in public support for solar energy development in upstate New York *Energy Res. Soc. Sci.* **86** 102449
Pascaris A S, Schelly C, Burnham L and Pearce J M 2021 Integrating solar energy with agriculture: industry perspectives on the market, community and socio-political dimensions of agrivoltaics *Energy Res. Soc. Sci.* **75** 102023
Pinto L M C, Sousa S and Valente M 2021 Explaining the social acceptance of renewables through location-related factors: an application to the Portuguese case *Int. J. Environ. Res. Public Health* **18** 806
Reinsberger K and Posch A 2016 *Dezentrale Energieversorgung – Die Rolle der Photovoltaik in der Energietransition* (Springer) pp 187–202
Ritchie H, Roser M and Rosado P 2024 Renewable energy (available at: https://ourworldindata.org/renewable-energy) (Accessed 21 May 2024)
Roddis P, Roelich K, Tran K, Carver S, Dallimer M and Ziv G 2020 What shapes community acceptance of large-scale solar farms? A case study of the UK’s first ‘nationally significant’ solar farm *Sol. Energy* **209** 235–44
Rodríguez-Segura F J, Osorio-Aravena J C, Frolova M, Terrados-Cepeda J and Muñoz-Cerón E 2023 Social acceptance of renewable energy development in southern Spain: exploring tendencies, locations, criteria and situations *Energy Policy* **173** 113356
Salm S, Hille S L and Wüstenhagen R 2016 What are retail investors’ risk-return preferences towards renewable energy projects? A choice experiment in Germany *Energy Policy* **97** 310–20
Schall D L 2020 More than money? An empirical investigation of socio-psychological drivers of financial citizen participation in the German energy transition *Cogent Econ. Finance* **8** 1777813
Schmid J 2023 Decentralization and wind energy permitting: an evaluation of implementation effectiveness in Switzerland and Europe *Dissertation* Nomos
Schumacher K, Krones F, McKenna R and Schultmann F 2019 Public acceptance of renewable energies and energy autonomy: a comparative study in the French, German and Swiss Upper Rhine region *Energy Policy* **126** 315–32
Semeraro T, Pomes A, Del Giudice C, Negro D and Aretano R 2018 Planning ground based utility scale solar energy as green infrastructure to enhance ecosystem services *Energy Policy* **117** 218–27
Seyfang G, Park J J and Smith A 2013 A thousand flowers blooming? An examination of community energy in the UK *Energy Policy* **61** 977–89
Sharpton T, Lawrence T and Hall M 2020 Drivers and barriers to public acceptance of future energy sources and grid expansion in the United States *Renew. Sustain. Energy Rev.* **126** 109826
Sloot D, Jans L and Steg L 2019 In it for the money, the environment, or the community? Motives for being involved in community energy initiatives *Glob. Environ. Change* **57** 101936
Stadelmann-Steffen I, Brückmann G, Ruprecht S, Duygan M, Hecher M A, Wüstenhagen R, Mili S, Schmidt T and Schmid N 2022 SWEET-EDGE survey (unpublished) (available at: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/OL3VHQ)
Stadelmann-Steffen I and Dermont C 2021 Acceptance through inclusion? Political and economic participation and the acceptance of local renewable energy projects in Switzerland *Energy Res. Soc. Sci.* **71** 101818
Stadelmann-Steffen I, Ingold K, Rieder S, Dermont C, Kammermann L and Strotz C 2018 *Akzeptanz Erneuerbarer Energie* (Universität Bern, Interface Politikstudien Forschung Beratung, EAWAG)
Stauch A and Vuichard P 2019 Community solar as an innovative business model for building-integrated photovoltaics: an experimental analysis with Swiss electricity consumers *Energy Build.* **204** 109526
Strazzera E and Statzu V 2017 Fostering photovoltaic technologies in Mediterranean cities: consumers’ demand and social acceptance *Renew. Energy* **102** 361–71
Süsser D and Kannen A 2017 Renewables? Yes, please!’: perceptions and assessment of community transition induced by renewable-energy projects in North Frisia *Sustain. Sci.* **12** 563–78
Sütterlin B and Siegrist M 2017 Public acceptance of renewable energy technologies from an abstract versus concrete perspective and the positive imagery of solar power *Energy Policy* **106** 356–66
Swiss Federal Office of Energy 2019a Schweizer Hausdächer und -fassaden könnten jährlich 67 TWh Solarstrom produzieren (available at: www.bfe.admin.ch/bfe/de/home/news-und-medien/medienmitteilungen/mm-test.msg-id-74641.html) (Accessed 11 May 2023)
Swiss Federal Office of Energy 2019b Wasserkraftpotenzial der Schweiz (available at: www.newsd.admin.ch/newsd/message/attachments/58259.pdf) (Accessed 11 May 2023)
Tabi A and Wüstenhagen R 2017 Keep it local and fish-friendly: social acceptance of hydropower projects in Switzerland *Renew. Sustain. Energy Rev.* **68** 763–73
Thomas G, Demski C and Pidgeon N 2019 Deliberating the social acceptability of energy storage in the UK *Energy Policy* **133** 110908
Trandafir S, Thomas P, Bidwell D and Rezendes R 2023 Community benefit agreements for solar energy: examining values, preferences and perceived benefits in the United States using a discrete choice experiment *Energy Res. Soc. Sci.* **106** 103305

Trutnevyte E *et al* 2024 Renewable energy outlook for Switzerland *Technical Report* (Université de Genève)
Turney D and Fthenakis V 2011 Environmental impacts from the installation and operation of large-scale solar power plants *Renew. Sustain. Energy Rev.* **15** 3261–70
van den Berg K and Tempels B 2022 The role of community benefits in community acceptance of multifunctional solar farms in the Netherlands *Land Use Policy* **122** 106344
Vatter A 2020 *Das Politische System der Schweiz. 4. Auflage* (Nomos)
Vuichard P, Broughel A, Wüstenhagen R, Tabi A and Knauf J 2022 Keep it local and bird-friendly: exploring the social acceptance of wind energy in Switzerland, Estonia and Ukraine *Energy Res. Soc. Sci.* **88** 102508
Vuichard P, Stauch A and Wüstenhagen R 2021 Keep it local and low-key: social acceptance of alpine solar power projects *Renew. Sustain. Energy Rev.* **138** 110516
Wolsink M 2000 Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support *Renew. Energy* **21** 49–64
Wüstenhagen R, Wolsink M and Bürer M J 2007 Social acceptance of renewable energy innovation: an introduction to the concept *Energy Policy* **35** 2683–91
Yu X 2014 Is environment 'a city thing' in China? Rural–urban differences in environmental attitudes *J. Environ. Psychol.* **38** 39–48
Zumbrunn A 2024 Confidence across cleavage: the Swiss rural–urban divide, place-based identity and political trust *Swiss Polit. Sci. Rev.* **30** 46–65