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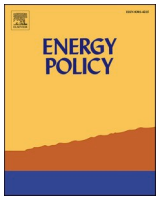

"I take the green one": The choice of regional green electricity contracts in the light of regional and environmental identity

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ABSTRACT

Most studies that focus on the choice of electricity contracts rely on the concept of utility-maximizing agents. However, since electricity is a low-involvement good and choosing an electricity contract is cognitively demanding, these studies may be misguided. Therefore, we investigate whether the choice of an electricity contract is instead driven by decision heuristics. Based on a stated choice experiment on electricity contracts, we find a willingness to pay for regional and green electricity that is causally affected by environmental and regional identity. Moreover, we find that about 40% of electricity contract choices are guided by the heuristic of choosing the greenest electricity mix. Decision heuristics based on regional contract characteristics occur less frequently. However, their use increases significantly when regional identity is salient. Thus, environmental and regional identity is a channel that can be used by policy makers and electricity providers for targeted marketing or information campaigns to increase demand for regional electricity products.

1. Introduction

Germany is considered a pioneer in the field of renewable energies. In 2018 nearly 38% of total electricity consumption was covered by renewable energy sources compared to only 6% in the year 2000 (Umweltbundesamt, 2020). In recent years, however, the expansion of renewables has stagnated. For example, the net expansion of onshore wind power has halved in 2018 compared to the previous year (Bundesnetzagentur, 2019). Besides technical, economic and legal restrictions, one of the main challenges for the further expansion of renewables is a lack of acceptance. Despite general agreement on the energy transition and renewable energies, there is growing resistance to projects, especially wind power plants, at the local level, which could cause serious delays or even cancellation of projects. Since citizens are directly affected by renewable, decentralized power plants, e.g. through changes in the landscape, their attitudes have to be considered in policy making (e.g. Dimitropoulos and Kontoleon, 2009; Kalkbrenner et al., 2017).

In 2019, the German Federal Government introduced regional green electricity labels as a new marketing instrument for renewable energies in order to counter the problem of poor acceptance (Bundesministerium für Wirtschaft und Energie, 2016). Whether acceptance can actually be increased by this, however, depends on whether consumers wish to use electricity from power plants in their region, as already remarked by Kalkbrenner et al. (2017). In addition, consumers must be willing to pay for the regional label as the implementation of the regional electricity procurement will probably generate extra cost. Building on previous studies analyzing preferences and willingness to pay for regional green electricity production (e.g. Burkhalter et al., 2009; Kaenzig et al., 2013; Kalkbrenner et al., 2017; Mengelkamp et al., 2019; Groh, 2021), we aim to underpin the assumption that regional production of green electricity is an important electricity contract feature.

To this end, we analyze the choice of regional green electricity contracts not only under the assumption of utility maximizing respondents but also by considering the application of strategic decision heuristics. Therefore, we use data from a survey conducted in North-Hesse, Germany. The survey was conducted with regional electricity consumers and included a stated choice experiment on electricity contracts in order to investigate preferences for regional green electricity. Moreover, we included a regional and environmental priming treatment to examine whether preferences are causally driven by environmental and regional identity, since previous studies revealed that identity

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influences economic behavior (e.g. Benjamin et al., 2010, 2016; Cohn and Maréchal, 2016). Thus, our paper contributes to a deeper understanding of preferences and willingness to pay for regionality of electricity products in a local context and investigates whether consumer choices are influenced by identity. Accordingly, our results provide useful guidance for policy makers and electricity providers to effectively design and advertise electricity products aimed at expanding renewable energy production.

The paper proceeds as follows: Section 2 provides an overview on the German regional green electricity labeling, the current state of research on preferences for regionally produced green electricity and the role of identity in electricity contract choice. Section 3 describes the methods and data used, followed by the empirical results in Section 4. Finally, Section 5 concludes and gives some policy implications.

2. Background and literature review

2.1. Regional green electricity labeling

Since consumers are directly affected by local and decentralized renewable power plants, their acceptance of renewables is crucial for a successful transformation of the energy system (Kalkbrenner et al., 2017). Several studies that analyzed the reason behind citizens' resistance towards renewable projects in their region find different aspects, e.g. visual impacts, size of the project or participation possibilities, as explanation (e.g. Dimitropoulos and Kontoleon, 2009; Kalkbrenner et al., 2017). To increase the acceptance and push the expansion of renewables forward, the German Federal Government has implemented regional green electricity labeling to enable consumers to identify with renewable power plants in their region.

The regional green electricity labeling was introduced with the amendment of the German Renewable Energy Source Act (EEG) in 2017 and finally implemented in the beginning of 2019. If a plant operator wants to label the electricity it produces, it must report the zip code and the amount of electricity produced to the Registry of Regional Certificates administered by the German Federal Environmental Agency (UBA). The UBA issues regional certificates to the account of the plant operator according to the amount of produced electricity (each certificate corresponding to 1 MW hour). Since regional certificates cannot be traded separately from electricity, there must be a contractual supply chain between the plant operator and an electricity provider. The electricity provider is then allowed to purchase the regional certificates. After purchasing regional certificates, the electricity provider is allowed to report the share of regionally generated green electricity according to the amount of certificates purchased. To do so, however, the power plant from which the certificates were purchased must be located within a 50 km radius of the final consumers' postal code area. Endconsumers receive this information on their electricity bill (Bundesministerium für Wirtschaft und Energie, 2016).

2.2. Preferences for regional and green electricity

The acceptance of renewable energies as an essential prerequisite for their expansion has already been studied in various ways. For example, the willingness of citizens to invest in renewable energy facilities or to participate in renewable energy cooperatives can indicate a positive attitude toward renewable energies (e.g. Skordoulis et al., 2020; Fischer et al., 2021). In addition, signing green electricity or regional electricity contracts is also a way for consumers to express their preferences for renewable energies and to support their expansion. A large body of research on consumer preferences and the willingness to pay for green electricity, i.e. electricity generated from renewable energy sources, exists and shows that the majority of consumers indicate positive preferences for green electricity and are willing to pay a premium for its use (e.g. Goett et al., 2000; Dimitropoulos and Kontoleon, 2009; Gracia et al., 2012; Mattes, 2012; Kaenzig et al., 2013; Sagebiel et al., 2014; Tabi et al., 2014; Buryk et al., 2015; Huh et al., 2015; Kalkbrenner et al., 2017; Knoefel et al., 2018; Engler et al., 2019; Plum et al., 2019). In line with the literature, we expect that green electricity is preferred over other energy mixes.

In contrast to the literature on energy mixes, there are only a few studies on location preferences of electricity production. For example, Burkhalter et al. (2009) and Kaenzig et al. (2013) examine preferences for the location of electricity production and find that consumers indicate a positive preference for electricity produced in the own or at least in the German region. However, both studies only examine the location of electricity production in a more general context, i.e. whether the electricity is produced in Germany or abroad, rather than the amount of electricity produced regionally. Mengelkamp et al. (2019) take regional and local production into account by introducing a regional and local green electricity mix in addition to a normal green or gray mix but find that the general green mix is preferred over the regional and especially over the local production. Kalkbrenner et al. (2017) and Groh (2021) investigate preferences for specific shares of locally produced green electricity and therefore allow for a mix of locally and nationally produced electricity. Kalkbrenner et al. (2017) reveal that the regional production of green electricity is only of minor importance for the choice of electricity contracts compared to other product features, e.g. electricity mix or electricity costs. However, they also find that consumers value a shift from zero to at least a small share of regional production of green electricity and have a slight additional willingness to pay for it. Given this, they conclude that regional electricity generation will - at least in the future (as it is for many other products) - be an important electricity attribute. In line with this, Groh (2021) finds that the willingness to pay for electricity is increasing with the regionally produced share. Therefore we expect to find positive preferences for regionally produced green electricity.

In addition to the regional production of green electricity, the regional ties of providers could also play a role in the choice of electricity contracts. For example, Sagebiel et al. (2014) investigate preferences for electricity from energy cooperatives and find that consumers are willing to pay more for a higher share of renewable energies in the electricity mix but also value transparency, participation and local ties of providers. In addition, Mattes (2012) reveals that attributes related to the electricity provider such as local roots or investments in renewable energies play an important role when choosing between electricity contracts. Kalkbrenner et al. (2017) and Groh (2021) find that regional and local providers are preferred over German providers as well as foreign providers. According to the previous findings, we expect electricity consumers to have a higher preference for regional or local electricity providers compared to large national or foreign providers.

Besides contract characteristics, also individual specific characteristics such as individual identity could also influence electricity contract choice. Akerlof and Kranton (2000) provide an economic model of behavior to show the effects of identity based pay-offs on economic behavior and recommend to include identity in utility functions. For the investigation of identity effects priming experiments are increasingly used. Cohn and Maréchal (2016) give an overview of economic priming studies including a wide range of different identities and outcome variables such as effects of ethnic culture on time and risk preferences, effects of criminal identity on cheating behavior, effects of professional identity in the banking industry, or the influence of religious affiliation on economic outcomes or altruism. There are also some studies revealing that environmental identity induces pro-environmental behavior. For example, Tate et al. (2014) find that respondents in an environmental priming condition more often choose unwrapped products compared to respondents in a control group. Similarly, Engler et al. (2019) find that respondents primed with their environmental identity behave greener when choosing between electricity contracts.

In addition to environmental identity, it is possible that feelings about one's own region is correlated with the preferences for electricity production in the region. Several studies reveal a correlation of regional

Table 1
Overview of the sample.

Variables	Control group	Regional priming group	Environmental priming group	Overall	F-test p-value
Green electricity tariff	0.38	0.39	0.42	0.40	0.628
Do not know electricity tariff	0.25	0.23	0.19	0.22	0.241
Monthly electricity costs	70.46	65.60	70.28	68.72	0.474
Do not know electricity costs	0.39	0.35	0.36	0.37	0.633
Actively changed tariff	0.49	0.51	0.51	0.51	0.872
Female	0.43	0.48	0.44	0.45	0.498
Age	46.02	46.32	44.79	45.72	0.643
Household size	2.41	2.21	2.44	2.35	0.078
Number of children	0.92	0.95	0.89	0.92	0.864
High education[a]	0.59	0.63	0.58	0.60	0.456
High income[b]	0.44	0.39	0.36	0.39	0.316
Observations	224	223	216	663	

Notes: The table reports treatment means. The p-value in the last column is the probability from a joint F-test across all treatments. Fifteen participants did not report age, twelve participants did not report household size, four participants did not report number of children and level of education and one hundred fifty two participants did not report income. Mean electricity costs are based on 421 observations, of which 137, 146, and 138 observations belong to the control group, the regional priming group and the environmental priming group, respectively.

[a] High school diploma or higher degree.

[b] 3000 Euro or more per month (net income).

identity with preferences for various environmental goods. For example, Carrus et al. (2005) find that regional pride, together with pro-environmental attitudes, appears to be of main importance for supportive attitudes towards natural protect areas. In addition, Faccioli et al. (2020) find that environmental attitudes together with local identity significantly influence the willingness to pay for peatland restauration and are thus important drivers for preferences. Effects of regional identity on electricity contract choice are for example observed by Mengelkamp et al. (2019) who find differences in preferences between their regional sample with a high average regional identity and their representative sample with a lower average regional identity. Accordingly, we expect that environmental and regional identity positively affect preferences and willingness to pay for regional green electricity.

2.3. Decision heuristics in electricity contract choice

Most studies that focus on the choice of electricity contracts rely on the concept of utility-maximizing agents. However, since electricity is a low-involvement good and choosing an electricity contract is cognitive demanding, these studies may be misguided. Decision or choice heuristics emerged in the field of economics, assuming that decision makers use mental processing rules to cope with situations of high complexity and to make fast and frugal decisions (Leong and Hensher, 2012). It is assumed that every person already owns a repertory of such decision strategies. An overview of heuristics is given by Leong and Hensher (2012). The extent to which the context of a choice situation can have an effect is shown, for example, by Glenk et al. (2019). They find that different cost vector treatments lead to respondents following different decision heuristics in choice experiments and therefore their choices are not in line with utility maximization. Moreover, Guala and Filippin (2017) find that group identity could stimulate heuristics that provide guidance in unfamiliar situations. Therefore, we investigate if electricity contract choice is guided by decision heuristics instead. We expect that respondents apply decision heuristics when making a choice between electricity contracts and that environmental and regional identity stimulate decision heuristics that favor the choice of green and regional electricity contracts.

3. Data and methodology

3.1. Data collection and dataset

Our empirical analysis is based on data from a street survey conducted by staff of the University of Kassel among adults in pedestrian zones or in front of various supermarkets in Northern Hesse, Germany in autumn 2018. The questionnaire consisted of three parts. The first part of the questionnaire referred to a framed field experiment that is, however, not considered in this paper. The second part contained a combined priming and stated choice experiment, which is the focus of this paper, and the third part referred to a short electricity quiz, individual preferences and attitudes as well as socio-economic variables. In total, 679 persons participated in the survey. 16 respondents had to be excluded from the analysis as they terminated the interview. Therefore, our empirical analysis is based on 663 respondents. Respondents were randomly assigned into three treatment groups. 224 respondents were assigned to the control group and 223 (216) were assigned to the regional (environmental) priming group. Table 1 provides an overview of the electricity-related and socio-economic variables for the whole sample as well as for the three subgroups.

In our sample, 22% of all respondents do not know what kind of electricity contract they are currently using. Of the 78% who know what kind of electricity contract they currently have, more than half already use a green electricity contract (in German "Ökostromtarif").[1] The share of green electricity contracts in our sample is high compared to the German average. For example, in 2018 only about 24% of all German consumers used a green electricity contract (Bundesnetzagentur, 2019). The large deviation can be explained by the fact that the basic provider in the region, where the study took place, only provides electricity contracts that are based on 100% renewable energies for private customers. In line with the poor knowledge on the electricity mix, 37% of respondents do not know their monthly electricity costs. The average monthly electricity payment of the respondents who know their electricity costs is 69 Euros and 51% of the respondents actively changed their electricity tariff at least once in the last 10 years. Compared to the overall German population, our sample contains fewer women (45% vs 51%) and more highly educated individuals (60% vs 32%). Furthermore, respondents on average are slightly older (45.72 years vs 44.40 years) and the average household size is slightly larger (2.35 persons vs 1.99 persons)(Statistisches Bundesamt, 2020; Statista, 2021a,b,c).

Table 1 also provides evidence of a successfully randomized assignment of respondents into treatments. Joint F-tests show that our control and treatment groups are well balanced on the observed characteristics. Only for household size a statistically significant difference is indicated

[1] In Germany, the selling of renewable energy is administered by the Register of guarantees of origin. An electricity provider can label an electricity contract to be green if it cancels guarantees of origin at the Register for the delivered amount of renewable electricity (Umweltbundesamt, 2021).

at a significance level of 0.078.

3.2. Stated choice experiment

Stated choice experiments are frequently used to elicit preferences for energy-related products and services by asking consumers or respondents to hypothetically choose one option from a set of competing alternatives. Therefore, the studied product or service is split up into several product features, called attributes, which vary at different levels (Buryk et al., 2015). Accordingly, stated preference techniques are in particular interesting for examining preferences for new products or products not traded in real markets since they allow to control the information flow and therefore to include hypothetical product features (Kaenzig et al., 2013) like for example regionally produced green electricity.

Another feature of hypothetical choice experiments is that not only one choice can be observed per respondent but several hypothetical choices. Thus, in our experiment each respondent faced six choice tasks. In each task respondents were asked to choose between three hypothetical electricity contracts and their current electricity contract. The contracts in each choice set were characterized by five attributes with five attribute levels each. The attribute levels of the hypothetical contracts are combined using a d-efficient design created with the software package NGene. The design provides 60 choice sets divided into ten blocks such that each respondent randomly received one block of six choice sets. Table 2 gives an overview on the attributes and attribute levels that characterize the electricity contracts while Table 3 shows an exemplary choice task.

The attributes were chosen based on our research interest, but also with regard to findings from previous studies on preferences for green and regional electricity contracts (e.g. Burkhalter et al., 2009; Mattes, 2012; Kaenzig et al., 2013; Groh, 2021). The first attribute, the electricity mix, consists of various combinations of fossil fuels, nuclear power and renewables. Thereby, the combinations range from half coal and half nuclear power all the way to 100% renewables. Since the aim of this study is to measure preferences for regional electricity contract features, we additionally consider two regional attributes. The location of electricity production in a broader definition, i.e., whether electricity is produced in one's own region, in Germany, or abroad, has already been used as an attribute in previous studies (e.g. Burkhalter et al., 2009; Kaenzig et al., 2013). In our study, however, we aim to provide a more detailed picture of preferences for regional production of green electricity, similar to Kalkbrenner et al. (2017) and Groh (2021). To this end, we consider five different shares of regionally produced green electricity, namely 0%, 25%, 50%, 75%, and 100%. Second, we consider the type of the electricity provider, as this attribute has also been shown to be important in previous studies (e.g. Burkhalter et al., 2009; Groh, 2021; Kalkbrenner et al., 2017; Mattes, 2012; Sagebiel et al., 2014). In total, five providers are distinguished: a foreign, national, supranational, regional, and local electricity provider.

As a fourth attribute, we additionally consider a bonus payment. In order to compete in the market, electricity providers are increasingly developing new products, services or product bundles. An example of such a product innovation is a bonus payment that is directly linked to the provider's electricity yield, i.e. a profit-sharing scheme. In other words, the customer receives a payment if the electricity yield is above average in a given year. Overall, we consider five different types of participation schemes, i.e. no bonus payment, a contribution to the customer's membership fee for an electricity cooperative, a donation to a regional or environmental non-profit organization, or a voucher for energy-efficient appliances.

Finally, as a fifth attribute, electricity costs are included as our payment vehicle. The costs decrease or increase in the range of − 30% to + 30% relative to the respondents' current annual electricity costs. The price range is selected according to the prices on the electricity market together with experts from an electricity provider. Note that we freely combined the electricity costs with all other attributes, so it is also possible that a green and regional electricity contract is cheaper than a fossil and nuclear electricity contract. While this sounds counterintuitive at first glance, regional characteristics and policies such as subsidies could lead to such price reversals in the future.

While the hypothetical choice situation allows us to investigate preferences for a good not yet well known on the market, the results could suffer from hypothetical bias. To minimize the hypothetical bias, respondents were provided with a detailed description of the choice situation containing explanations of the attributes and attribute levels. In addition, we included an opt-out reminder on each choice task (e.g. Meyerhoff et al., 2018) and participants were asked about their current electricity mix and monthly electricity payments prior to the stated choice experiment in order to prepare them for the choice situation.

3.3. Priming experiment

To examine the influence of regional and environmental identity on the marginal willingness to pay for regional and renewable contract features, we combined the stated choice experiment with a priming experiment. Priming is an increasingly used experimental method to study the causal influence of identity by an external stimulus (e.g. Benjamin et al., 2010, 2016; Cohn and Maréchal, 2016; Krpan, 2017). The activation of a specific mental concept or social knowledge structure may affect the studied behavior without the participants being aware of this (e.g. Bargh, 2006). The priming task is usually implemented directly before the behavior or choice studied. In this study, our identity manipulation consisted of a short information and two to six statements to which the respondents had to agree or disagree as well as a question on group membership. The statements and questions are either related to regional identity, environmental identity, or to no specific identity.

The control group was primed with no specific identity. Respondents in this group received the information: *"Our electricity consumption depends on a wide variety of things. We would therefore be interested to know how you normally live."*. After this information, we asked the respondents in this group to indicate to what extent they agree with the following two statements on a scale of one "strongly disagree" to five "strongly agree":

- I turn off the lights when I leave a room.
- I only read my newspaper on digital devices, such as a smartphone or tablet.

In addition, we asked them *"How many people, yourself included, permanently live in your household?"*.

The regional priming group received the following information: *"Electricity is produced all over Germany, including here in the region. We would therefore be interested to know how you feel about your region."*. Respondents in this group were asked to indicate their agreement on a five-point scale with the statements:

- I have no obligations to my region.
- I feel very connected to my region.

In addition, they answered the question *"Are you a member of a regional association or group or organization that is committed to the preservation of regional traditions or the promotion of the region?"*.

Finally, the environmental priming group received the information: *"The generation of electricity can have different effects on the environment. We would therefore be interested to know what your overall attitude is towards our nature and environment."*. After this, respondents in this group were asked to indicate their agreement on a five-point scale with the statements:

- Humans have the right to modify the natural environment to suit their needs.

Table 2
Attributes and attribute levels in the stated choice experiment.

Attribute	Level 1	Level 2	Level 3	Level 4	Level 5
Electricity mix	50% coal, 50% nuclear	34% coal, 33% nuclear, 33% renewables	50% nuclear, 50% renewables	50% coal, 50% renewables	100% renewables
Share of renewables that are regionally produced	0%	25%	50%	75%	100%
Electricity provider	Foreign provider	National provider	Supra-regional provider	Regional provider	Local provider
Bonus payment for an above average electricity yield year	No bonus payment	Contribution to membership fee of an energy cooperation	Donation to a regional non-profit organisation	Donation to an environmental non-profit organisation	Voucher for energy-efficient appliances
Increase/decrease of annual electricity costs	−30%	−10%	0%	+10%	+30%

Table 3
Sample choice task of the stated choice experiment.

Attributes	Contract 1	Contract 2	Contract 3	
Electricity mix	50% nuclear, 50% renewables	100% renewables	34% coal, 33% nuclear, 33% renewables	"Stick to my current tariff"
Share of renewables that are regionally produced	25%	100%	25%	
Electricity provider	Regional electricity provider	National electricity provider	Supra-regional electricity provider	
Bonus payment for an above average electricity yield year	Contribution to the membership of an energy cooperative	Voucher for energy-efficient appliances	Contribution to the membership of an energy cooperative	
Increase/decrease of current annual electricity costs	−10%	+30%	−30%	
I choose:	☐	☐	☐	☐

- Humans are severely abusing the planet.
- Plants and animals have the same right to exist as humans.
- Nature is strong enough to cope with the impacts of modern industrial nations.
- Humans were meant to rule over the rest of nature.
- The balance of nature is very delicate and easily upset.

In addition, respondents in this group answered the question *"Are you a member of a group or organization that is committed to the preservation and protection of the environment and nature?"*.[2]

After the priming task, respondents had to solve a word-completion task as a manipulation check (e.g. Cohn et al., 2014; Drupp et al., 2020). The task contained three word fragments: one that referred to regional identity, one that referred to environmental identity, and one word that did not refer to either of these identities to conceal the purpose of the test. Subjects were asked to fill in the blanks with letters to form words. The hypothesis is that when a specific identity is salient, words related to this identity are easier to access compared to other words and therefore primed respondents are more likely to fill in the related word. For example, respondents were shown "_ocal" that could be completed with the letter "l" to the word "local" which is at the heart of a regional identity or the letter "v" to the word "vocal" that is neither related to regional nor to environmental identity. We assigned the value one to a word that is related to the primed identity and zero to words that are not related to the primed identity.

Table 4 shows that the relative frequency of respondents who filled in words related to the specific identity in the regional and environmental treatment groups are higher than in the control group. Using two-sided Fisher's exact tests, we can reject the null-hypothesis that the respondents in the priming treatments and in the control treatment are equally likely to name the word related to the primed identity. This is supporting evidence that our priming treatments made the corresponding identity more salient compared to the control treatment. Both priming treatments increased the relative frequency of respondents filling in letters related to regional and environmental identity in comparison to our control treatment although only primed for either the one or the other identity. The Fisher's exact test for the regional and environmental priming treatments show that respondents in the environmental priming group are more likely to name the environmental word compared to the regional priming group.[3] For the regional word, we do not find a significant difference between the priming treatments. This result points to a potential relationship between regional and environmental identity, which would be in line with the argument that regional electricity production contributes to environmental sustainability.

3.4. Empirical approach

In a first step, our empirical approach relies on the assumption of utility maximizing individuals. Thus, the analysis of the choices in the experiment is based on the random utility theory where the utility from electricity consumption is modeled on the basis of alternative electricity contracts that differ in their attributes. As we expect heterogeneity of preferences across individuals, we apply mixed logit models using maximum likelihood simulation. Furthermore, mixed logit models do not rely on the assumption of independence from irrelevant alternatives or independence of choices, which is important as respondents performed six sequential choices (e.g. Revelt and Train, 1998; Greene, 2003).

The choices made by the respondents in the experiment act as our dependent variable, while the attributes are considered as explanatory variables. With the exception of electricity costs that are considered as continuous variable, dummy variables for the attributes levels are

[2] The six statements for the environmental priming group represent an abbreviated version of the widely used New Environmental Paradigm scale for measuring environmental awareness (Dunlap et al., 2000; Whitmarsh, 2008). Ultimately, we asked all survey participants for their agreement with these statements. However, in the environmental priming group we did this immediately before the choice experiment, whereas for respondents in the other two groups this was done after the choice experiment. The same applies to the statements used in the control group and in the regional priming group.

[3] The significant difference could also be driven by the higher number of statements evaluated in the environmental priming group compared to the other treatments.

Table 4
Relative frequencies of identity-related words in the manipulation test.

	Relative frequencies			P-values of two-sided Fisher's exact test		
Word completion task	Control group	Regional priming group	Environ- mental priming group	Control vs. regional priming group	Control vs. environmental priming group	Regional vs. environmental priming group
Regional word	35.59%	49.55%	45.97%	0.004	0.031	0.501
Environmental word	33.93%	52.02%	72.64%	0.000	0.000	0.000

included. To capture status quo preferences, we include an alternative specific constant that takes the value one for the current electricity contract of the respondent and zero for the hypothetical electricity contracts. Furthermore, we use information on respondent's current electricity contract to define respondent specific status quo attribute levels. For respondents who indicated to have a green electricity contract, the status quo electricity mix is "100% renewables" in the analysis. For respondents who indicated not to have a green electricity contract we consider a generic electricity mix as the status quo level. We also assign the generic mix to respondents who did not know their current contract. As the regional green electricity labeling was not jet possible at the time of the survey, the regional share is set to zero percent for all respondents. We do not have respondent specific information for the electricity provider. As the basic electricity supply in the region of the study is ensured by the municipal utility of the region, we set "regional electricity provider" as the status quo level for all respondents. The bonus payment is also set to "no bonus payment", as such participation schemes are, to the best of our knowledge, currently not offered.

We let all non-price attributes be normally distributed, including the alternative specific constant for the status quo alternative. For each random parameter, the mean and standard deviation is estimated (e.g. Louviere et al., 2010). In all models, the simulation of the log-likelihood is performed using 1,000 Halton draws. The mean willingness to pay for an attribute is defined as the trade-off between a change in the attribute and a change in price. Confidence intervals for the mean willingness to pay are calculated using the Krinsky and Robb (1986) bootstrapping procedure. In order to evaluate treatment effects on mean willingness to pay estimates in a split sample approach, we use the complete combinatorial test developed by Poe et al. (2005).

The second step of our empirical analysis allows a deviation from the utility maximization by including decision heuristics. Therefore, we follow the procedure of Glenk et al. (2019) applying a number of non-parametric tests to investigate systematic decision strategies. We first identify individuals that followed specific decision heuristics and then investigate the influence of identity on their application by testing if equality of incidence across priming treatments can be rejected.

4. Results

4.1. Preferences and willingness to pay for green and regional electricity

Table 5 reports the estimated mean and standard deviation parameters (including robust z-statistics) in the mixed logit model for the control treatment, the regional priming treatment and the environmental priming treatment. All results for the dummy coded variables, are reported in comparison to the following reference levels: a mix without renewables (50% coal and 50% nuclear) (electricity mix), no regional production (regional production), a foreign provider (electricity provider), and no bonus payment (bonus payment). In line with economic theory, the control treatment reveals that the estimated parameter for electricity cost is significant and negative. The estimated mean parameter for respondents' preferences for their current electricity contract is not significantly different from zero while the estimated standard deviation parameter shows that preferences for the status quo alternative are heterogeneous.

With respect to preferences for different electricity mixes, our results are in line with previous studies (e.g. Goett et al., 2000; Kaenzig et al., 2013; Engler et al., 2019). Table 5 shows a clear preference for a green electricity mix that is heterogeneous across respondents. A mix of coal and renewables is the second most preferred mix, but the parameter is only weakly significantly different from the mix without renewables. Preferences for the mixes that include nuclear power are statistically not different from the 50% coal and 50% nuclear mix at all common significance levels. It is interesting that electricity mixes containing nuclear energy in combination with less fossil energy are less preferred than the mix of 50% coal and 50% renewables even though these mixes are related to fewer greenhouse gas emissions. This phenomenon could, for example, be explained by the perceived importance of the risk of nuclear accidents and the final storage of nuclear waste by Germany citizens (Groh and Möllendorff, 2020). Furthermore, Germany is already phasing-out nuclear energy and will shut down the last nuclear power plants in 2022 (Bundesregierung, 2011). Thus, similar experiments in other countries could probably produce different results, or at least a different ranking of the mixes.

Moving from the type of electricity generation to the location of renewable electricity generation, our results indicate a higher importance of regional electricity contract features compared to previous studies (e.g. Burkhalter et al., 2009; Kaenzig et al., 2013; Kalkbrenner et al., 2017; Groh, 2021). The estimated mean parameters in the control treatment reveal that regional production is appreciated if at least 50% of renewables had been produced in the region. Generally, higher shares are preferred over lower shares. The estimated standard deviations for the mean parameters are not statistically different from zero at all common significance levels. Thus, there is no clear evidence on heterogeneous preferences across respondents with respect to the regional production of renewable energy.

The importance of regional contract features also appears in the estimated parameters for the electricity provider types in line with previous literature (e.g Burkhalter et al., 2009; Mattes, 2012; Kalkbrenner et al., 2017; Groh, 2021). All provider types are significantly preferred over foreign providers. Preferences for national and supra-regional providers as well as preferences for regional and local providers are from a similar size with the latter two providers preferred over the others. This could imply that respondents had difficulties to differentiate between the definitions. While the standard deviations for the national and supra-regional provider is not statistically significant, the standard deviation for regional and local providers is significant and suggests the presence of a considerable degree of unobserved preference heterogeneity in the data.

The estimated means of the bonus payments are not significantly different from zero with the exception of a donation for a regional non-profit organization that is weakly significant and positive. Also the corresponding estimated standard deviation is not statistically different from zero with the exception of a donation to an environmental organization.

In a nutshell, our results in the control treatment point to the potential that regional production of green electricity is valued by electricity consumers, however, in line with previous studies it seems to be of much less importance compared to the electricity mix and electricity costs which have the greatest influence on the choice between electricity contracts. Nevertheless, we find that in a regional context, where it is possible to refer to local power plants, regional features of an electricity

Table 5
Simulated maximum likelihood estimates (robust z-statistics) in mixed logit models.

Variables	Control group		Regional priming group		Environmental priming group	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Electricity costs	−5.063***	–	−2.904***	–	−3.489***	–
	(-8.91)	–	(-5.93)	–	(-6.04)	–
Status-Quo	−0.265	3.708***	0.277	3.030***	0.125	3.429***
	(-0.57)	(7.92)	(0.74)	(8.76)	(0.28)	(7.42)
Electricity mix (reference category: 50% coal, 50% nuclear)						
34% coal, 33% nuclear,	−0.351	−1.951***	0.164	0.285	0.567	1.430***
33% renewables	(-0.60)	(-4.03)	(0.26)	(0.84)	(0.81)	(4.33)
50% nuclear, 50% renewables	0.249	1.477***	0.823	1.670***	0.615	2.122***
	(0.45)	(3.50)	(1.23)	(5.35)	(0.78)	(5.22)
50% coal, 50% renewables	0.907*	1.613***	0.957	1.400***	0.982	2.393***
	(1.75)	(3.27)	(1.48)	(3.84)	(1.53)	(4.96)
100% renewables	4.248***	−2.498***	4.046***	2.487***	5.024***	3.380***
	(7.26)	(-8.40)	(5.97)	(7.99)	(6.09)	(5.80)
Regional production of green electricity (reference category: 0%)						
25%	0.057	0.063	0.488*	0.079	1.260***	−0.047
	(0.20)	(0.19)	(1.85)	(0.61)	(3.92)	(-0.35)
50%	0.434*	0.051	0.737***	0.108	1.178***	0.837**
	(1.65)	(0.20)	(3.14)	(0.85)	(4.02)	(2.34)
75%	0.544**	0.437	0.789***	0.755	0.806**	1.446***
	(2.05)	(0.52)	(2.72)	(1.54)	(2.30)	(3.59)
100%	0.963***	−0.186	0.588**	1.132***	1.660***	−0.340
	(3.64)	(-0.36)	(2.00)	(2.88)	(4.98)	(-1.02)
Electricity provider (reference category: foreign provider)						
German	1.378***	−0.249	1.756***	0.156	0.707**	0.874
	(4.17)	(-0.66)	(4.81)	(1.03)	(2.11)	(1.42)
Supra-regional	1.273***	−0.360	1.053***	0.387	1.221***	−0.808
	(4.40)	(-0.95)	(3.86)	(0.87)	(4.01)	(-1.33)
Regional	2.146***	−1.225***	2.127***	1.002***	2.106***	0.819***
	(6.22)	(-3.11)	(6.74)	(2.75)	(6.49)	(3.11)
Local	2.064***	−0.698*	2.190***	0.708**	1.891***	0.698
	(6.62)	(-1.81)	(7.43)	(2.07)	(6.31)	(0.91)
Bonus payment (reference category: no bonus payment)						
Contribution to membership fee energy cooperative	−0.204	−0.075	0.046	0.185	0.580*	0.165
	(-0.69)	(-0.11)	(0.20)	(0.92)	(1.95)	(0.54)
Donation to a regional non-profit organisation	0.476**	−0.036	0.230	−0.001	0.691***	−0.966**
	(1.98)	(-0.19)	(1.13)	(-0.01)	(2.69)	(-2.47)
Donation to an environmental non-profit organisation	0.068	−0.939*	0.120	0.687	0.443	0.671
	(0.25)	(-1.74)	(0.53)	(1.39)	(1.42)	(1.37)
Voucher for energy- efficient appliances	0.101	0.448	0.213	−0.130	0.222	0.688
	(0.43)	(1.29)	(1.05)	(-0.82)	(0.92)	(1.18)
Number of observations (respondents)	1344 (224)		1338 (223)		1296 (216)	

Notes: * (**, ***) means that the corresponding parameter is different from zero at the 10% (5%, 1%) significance level.

contract and also of the electricity provider are of greater importance than in a national context in previous studies (e.g. Kaenzig et al., 2013; Kalkbrenner et al., 2017). This could be due to the fact that national, representative studies might omit regional specifics, such as proximity to a local wind park or even personal influencing factors like the bond with one's own region. Similar results are also obtained by Mengelkamp et al. (2019), where regional customers show a higher preference and willingness to pay compared to a national sample.

Comparing results in Table 5 across the three treatment groups, we find some qualitative differences. In the regional and environmental treatment groups, the estimated parameters of the mix of coal and renewables is not significantly different from the no renewable mix at all common significance levels. Furthermore, the estimated parameters of the regional production of green electricity are significant for all considered levels. On top of that, while the estimated parameters of the non-price attributes are relatively equal in size, the estimated mean parameter of cost varies strongly across the three treatment groups.

To investigate this issue in more detail and to allow a quantitative comparison across treatments, the mean willingness to pay is estimated based on the results reported in Table 5. Mean willingness to pay estimates are expressed as deviation from the current electricity cost in percentage points. Fig. 1 reports willingness to pay estimates for all attributes with significant mean parameters for all treatments to allow a meaningful comparison (for detailed estimates see Appendix A). Accordingly, the willingness to pay is calculated for a 100% renewables electricity mix, for a 50–100% share of regionally produced green electricity and all types of electricity providers. Although willingness to pay estimates might be biased due to the hypothetical choice situation, this is not problematic in the study context as we are not interested in the absolute levels of the estimates but in relative preferences as well as in the treatment effects that should be unaffected by the hypothetical bias.

Overall, the willingness to pay estimates for all groups suggest that regional features, while again less important than green electricity, are valued on a relatively higher level compared to previous studies. Comparing the treatment groups, Fig. 1 reveals that respondents in the environmental and regional priming treatment are on average willing to pay more for a 100% renewables mix than respondents in the control treatment. In addition, a Poe et al. (2005) test confirms that the differences in willingness to pay between the control and environmental priming group and the control and regional priming group, respectively, are highly significant ($p = 0.019$ and $p = 0.044$). Differences in the mean willingness to pay between the two priming treatments are not statistically significant. Accordingly, both regional and environmental identity have a positive effect on the willingness to pay for a 100% renewables electricity mix.

With respect to regional attributes, the willingness to pay for regionally produced green electricity is higher in the regional and the environmental priming treatment compared to the control treatment. Poe et al. (2005) tests confirm that differences in the mean willingness to pay are significantly different from zero for some shares. The difference

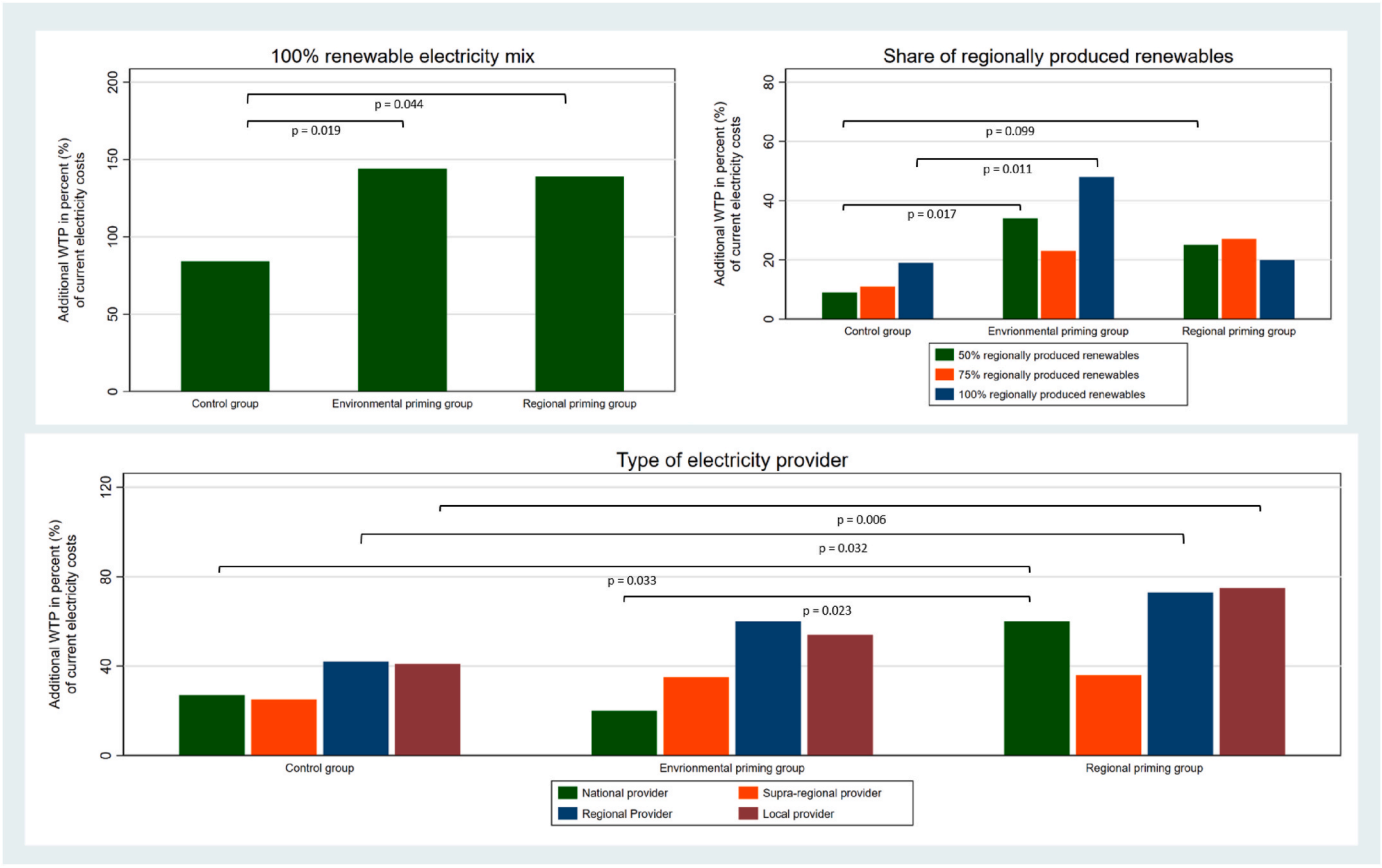

Fig. 1. Mean willingness to pay by attribute and treatment group.

between the control and regional treatment group is statistically significant for 50% ($p = 0.099$), while the difference between the control and environmental treatment group is highly significant for 50% and 100% regionally produced green electricity ($p = 0.017$ and $p = 0.011$). Again, no statistically significant differences are observed between the two priming treatments.

Considering the type of the electricity provider, regional priming significantly increases the willingness to pay for a German, regional and local provider compared to the control treatment ($p = 0.033$, $p = 0.032$ and $p = 0.006$). Moreover, the willingness to pay for a German provider is also significantly higher in the regional priming group compared to the environmental priming group ($p = 0.023$). This again indicates that regional characteristics of electricity contracts are valued higher in a regional context.

The comparison across treatment groups implies that stimulating regional and environmental identity has a significant influence on preferences and the willingness to pay for regional electricity attributes. Thus, we support the finding of Engler et al. (2019) that environmental identity causally affects preferences for renewable energies and extend it by showing that this is also true for regional identity. While the priming treatments both affect preferences for environmental and regional features, the revealed similarities and differences in their effects point towards shared values of the considered identities but also towards important contrasts. The salience of both identities increase preferences for renewable energies that are produced in the region – at least to a certain degree. While environmental identity drives preferences for 100% regional production, regional identity drives preferences for German, regional and local electricity providers. This could imply that the stimulation of environmental identity increases the acceptance of renewable electricity plants in the own region while the stimulation of regional identity sharpens the focus on regional value added.[4]

4.2. *Decision heuristics in electricity contract choice*

While the results in Table 5 and Fig. 1 show that respondents have a willingness to pay for regional green electricity and that identity causally influences preferences, we now relax the assumption of utility maximizing individuals by investigating the use of decision heuristics when choosing between electricity contracts. The application of a decision heuristic implies that individuals do not take all presented contract attributes into account and trade them off, but that their decision is guided by a simple rule. Therefore, we examine whether respondents follow a specific rule across the six choice tasks. From the set of potential heuristics, we consider four simple decision heuristics that target single attributes: (i) always choose the cheapest non-status quo option (cheapest option), (ii) always choose the greenest non-status quo option (greenest mix, i.e. the mix including the highest share of renewables), (iii) always choose the non-status quo option with the highest regional production (highest regional production), and (iv) always choose the non-status quo option with the most regional provider (most regional provider).

Table 6 reports the relative frequencies of respondents in all

[4] Please note that our priming treatments do not induce certain identities but make existing identities of an individual more salient. An increase in the salience of an identity can be compared to a change in identity strength (e.g. Benjamin et al., 2010, 2016).

Table 6
Relative frequencies of respondents applying decision heuristics and p-values of two-sided Fisher's exact tests.

Variables	Relative frequencies			P-values of two-sidedFisher's exact test		
	Control group	Regional priming group	Environ- mental priming group	Control vs. regional priming group	Control vs. environmental priming group	Regional vs. environmental priming group
Cheapest option	12.95%	8.07%	8.80%	0.122	0.172	0.864
Greenest mix	40.63%	43.95%	43.52%	0.503	0.563	1.000
Highest regional production	4.91%	4.48%	3.70%	1.000	0.641	0.811
Most regional provider	12.50%	21.97%	14.81%	0.009	0.491	0.065

treatment groups who applied a specific decision heuristic in each of the six choice tasks as well as results of two-sided Fisher's exact tests. Accordingly, the most popular decision heuristic is the "greenest mix" heuristic regardless of the treatment. More than 40% of respondents in the different treatment conditions choose the electricity contract with the highest share of renewables in all choice sets if they did not opt for their current electricity contract. The second most popular decision heuristics are the "most regional electricity provider" and the "cheapest option". The heuristic with a major focus on regional production of renewable energy is considered by less than 5% of respondents in all treatments. Although we only take four decision heuristics into account, our descriptive analysis reveals that a large majority of respondents seem to apply strategic decision heuristics.

Using two-sided Fisher's exact tests, we test for differences between the treatment groups in the use of these specific heuristics. However, the null-hypothesis that the respondents are equally likely to use a specific decision strategy, can only be rejected for the "most regional provider" heuristic in the case of the control versus the regional priming group. Accordingly, respondents primed with their regional identity are more likely to apply this heuristic, i.e. to choose a regional or local provider in each decision, regardless of the other attributes, compared to respondents in the control treatment ($p = 0.009$). In contrast, there is no evidence for an influence of the environmental priming treatment on the application of any decision heuristic. The difference in the effectiveness of the priming treatments could either result from the high share of respondents already applying "the greenest mix" heuristic in the control group or could point to a stronger intervention of the regional priming into the decision process on electricity contract choice compared to environmental priming.

5. Conclusion and policy implications

Given the largely stagnated expansion of renewable energies in recent years, both technical solutions and social challenges need to be addressed, as the rejection of the further expansion of renewables seems to be increasing and cause serious delays or even cancellation of projects. In this regard, the recently introduced regional green power labeling in Germany is intended to increase acceptance of renewables at the local level. However, whether acceptance can be increased by providing regional electricity productions depends on whether consumers wish to use electricity from their own region. As previous studies have so far provided mixed results, we aimed to underpin the assumption that regional production of green electricity is an important electricity contract feature. To this end, we analyzed the choice of regional green electricity contracts not only under the assumption of utility maximizing respondents but considered the application of strategic decision heuristics among respondents. Furthermore, we analyzed if environmental and regional identity causally affect electricity contract choice with the help of a priming experiment.

Results, based on a stated choice experiment with 663 regional electricity consumers, show that there is a willingness to pay for regional electricity contract features that seems to be much higher compared to previous studies (e.g. Burkhalter et al., 2009; Kaenzig et al., 2013; Kalkbrenner et al., 2017; Groh, 2021). This possibly indicates that regional electricity generation is more important in a regional context than in a national context, which is also suggested by the results of Mengelkamp et al. (2019). Furthermore, contracting a regional or local energy provider seems to be from higher value than consuming regionally produced electricity. This could either be interpreted as higher trust in the regionality of providers compared to the newly introduced regionality of electricity production, but also a cautionary measure with respect to negative externalities related to the expansion of renewable energies and the well-known "not in my backyard" effect (e.g. Smith and Klick, 2007). However, in line with previous studies, regional contract features are still of less importance than the electricity mix and electricity costs. Regarding the electricity mix, respondents prefer 100% green electricity, while electricity mixes containing nuclear energy are least liked. This could be explained by the poor image of nuclear power in Germany, despite zero emissions, and the impending nuclear phase-out, and might be different in other European countries.

The analysis of the application of decision heuristics revealed that the application of the random utility model that underlies the assumption of utility maximizing individuals might be misguided as a large majority of respondents seems to apply strategic decision heuristics instead of trading-off the different contract attributes. The "greenest mix" heuristic is the most frequently applied heuristic, thus highlighting the high relevance of environmental considerations in electricity contract choice. Our analysis shows that electricity consumers do not trade-of contract characteristics as assumed by standard economists. More interesting, however, our result also point out that a large share of respondents is not willing to sign an electricity contract that is based on a non-renewable energy mix. Thus, we show that a green default contract would be in line with consumer preferences at least in Germany as also found by Kaenzig et al. (2013).

Furthermore, our results indicate that regional as well as environmental identity causally influence electricity contract choice. While preferences for a renewable and distributed energy system are driven by both identities, the salience of regional identity also triggers the choice of German, regional, and local electricity providers. The stimulation of environmental identity seems to increase preferences for renewable and regional electricity within the weighting of the different attributes in the decision process. The stimulation of regional identity additionally seems to change the decision process of several people as the analysis of decision heuristics revealed that the tendency to simply choose in favor of regional electricity providers by applying a heuristic increases with the stimulation of regional identity. Together with the results from the manipulation test in the priming experiment, our results show that both priming treatments work in a similar direction, which could be related to the fact that the two identities are strongly related with each other. Thus, the values of a regional identity largely coincide with those of the environmental identity and vice versa.

Our results suggest that the new regional electricity label is valued by individuals and should therefore be further established on the market by energy providers. However, in comparison to the well known concept of renewable electricity labels, the additional willingness to pay for regional labels is rather low. An information campaign by official

institution could help to increase interest. To increase the share of people who enter into an electricity contract with a renewable electricity mix and high shares of regional production, policy makers and electricity providers could stimulate regional as well as environmental identity as indicated by the priming experiment. In addition, we can recommend regional and local electricity providers to use their regional ties as a competitive advantage and to call on the regional identity of potential customers.

CRediT authorship contribution statement

Larissa Fait: Conceptualization, Formal analysis, Investigation, Writing – review & editing. **Elke D. Groh:** Conceptualization, Formal analysis, Investigation, Writing – review & editing. **Heike Wetzel:** Conceptualization, Formal analysis, Investigation, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Additional tables

Table A1
Mean willingness to pay estimates

Variables	Mean willingness to pay estimates [95% confidence interval]			P-values of two-sided Poe et al. (2005) test		
	Control group	Regional priming group	Environ- mental priming group	Control vs. regional priming group	Control vs. environmental priming group	Regional vs. environmental priming group
Electricity mix (reference category: 50% coal, 50% nuclear)						
100% renewables	0.839 [0.632; 1.114]	1.393 [0.922; 2.169]	1.440 [1.019; 2.110]	0.044	0.019	0.898
Regional production of green electricity (reference category: 0%)						
50%	0.086 [-0.016; 0.190]	0.254 [0.087; 0.476]	0.338 [0.167; 0.569]	0.099	0.017	0.568
75%	0.107 [0.005; 0.219]	0.272 [0.080; 0.547]	0.231 [0.038; 0.468]	0.164	0.290	0.737
100%	0.190 [0.089; 0.304]	0.202 [0.009; 0.475]	0.476 [0.281; 0.761]	0.932	0.011	0.103
Electricity provider (reference category: foreign provider)						
German	0.272 [0.147; 0.412]	0.604 [0.342; 1.017]	0.203 [0.022; 0.431]	0.033	0.533	0.023
Supra-regional	0.251 [0.148; 0.367]	0.363 [0.175; 0.607]	0.350 [0.188; 0.549]	0.326	0.342	0.904
Regional	0.424 [0.290; 0.577]	0.732 [0.491; 1.119]	0.604 [0.419; 0.862]	0.032	0.142	0.481
Local	0.408 [0.297; 0.529]	0.754 [0.534; 1.108]	0.542 [0.383; 0.762]	0.006	0.204	0.175

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