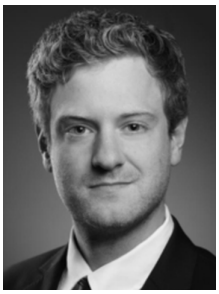
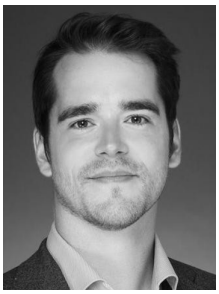
On the determinants of regional sustainable electricity consumption: Individual preferences and regional co-benefits





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Abstract: In an online study representative for Germany with 1,200 participants, we investigate which factors influence the demand for regionally produced electricity and the acceptance of the expansion of regional electricity generation capacities. In our regression analyses, we show that the preference for regional electricity is driven by demographic characteristics (gender, age, and education) as well as by individual economic preferences, regional identity, and our respondents' perception of regional co-benefits. The efficient utilization of regional sustainable power generation capacities will play a crucial role in the realization of the 'energy transition'. Our results show factors that are related to the preferences for regional electricity and could hence be used for marketing regional energy.

Keywords: Regional Electricity, Co-benefits, Sustainability, Economic Preferences, Experiment

Einflussfaktoren für die Nachfrage nach Regionalstrom: Individuelle Präferenzen und regionaler Zusatznutzen

Zusammenfassung: Wir untersuchen in einer für Deutschland repräsentativen Online-Studie mit 1.200 Teilnehmenden, welche Faktoren die Nachfrage nach regional produziertem, nachhaltigen Strom sowie die Akzeptanz des Ausbaus regionaler Stromerzeugungskapazitäten beeinflussen. In unseren Regressionsanalysen zeigen wir, dass die Präferenz für regionalen Strom neben demografischen Charakteristika (Geschlecht, Alter und Bildung) auch von individuellen ökonomischen Präferenzen, der regionalen Identität und der Wahrnehmung unserer Teilnehmenden zu regionalen Zusatznutzen getrieben wird. Die effiziente Ausschöpfung regionaler nachhaltiger Stromerzeugungskapazitäten wird eine entscheidende Rolle bei der Realisierung der *Energiewende* spielen. Unsere Ergebnisse zeigen Faktoren, die mit den Präferenzen für regionalen Strom zusammenhängen und für die Vermarktung regionaler Energie genutzt werden können.

Stichwörter: Regionale Elektrizität, Zusatznutzen, Nachhaltigkeit, Ökonomische Präferenzen, Experiment

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1 Introduction

As shown by the *Agentur für Erneuerbare Energien* (*AEE*) (2021), 83 % of the German population generally supports the "*Energiewende*" – the transition towards renewable energy. According to *Setton* (2019), however, the society perceives aspects such as costs, management, and fairness of it as potentially conflictual. For example, only 39 % of the interviewees would agree with the construction of wind powerplants within their living space, which seems to contradict the rather high general level of acceptance (*AEE* 2021). The lack of social acceptance might result in political interventions such as a minimum distance between wind powerplants and settlements which further prevents the exploitation of wind power production capacities (*Stede/May* 2019). Thus, the transition of the German energy system towards renewable energy production confronts decision makers, the German population, energy providers and many other stakeholders with challenges and new obstacles.

Understanding the determinants of the acceptance of the green transition not only on a national but also on a regional level hence seems to be crucial on the way towards a sustainable society. In fact, social acceptance constitutes a key aspect regarding the expansion of the German regional sustainable electricity production (*BMWi* 2015). Accordingly, in this paper, the demand for regional sustainable electricity is investigated. Regional sustainable electricity production will play a key role in achieving the targets of the "*Energiewende*". Understanding its advantages and disadvantages as well as its co-benefits and co-costs and the determinants of people's preferences regarding regional energy is of crucial importance. Regional sustainable electricity may, for example, generate diverse co-benefits: exploiting regional sustainable electricity production capacities could significantly decrease the socially conflictual expansion of electricity transmission systems or strengthen a region's sense of community.

There are several previous attempts to investigate potential barriers, obstacles, and determinants of sustainable behavior in domains that are related to sustainable electricity demand. E.g., *Ziegler* (2020) finds that individual economic and time preferences play an important role for choosing alternative and/or sustainable energy. Especially intertemporal preferences seem to be an important factor. The results of the incentivized experiment suggest that particularly patient individuals tend to switch to alternative and/or sustainable electricity contracts (*Ziegler* 2020). Likewise, *Fischbacher et al.* (2021) show a positive relation between the level of individual patience and the demand for energy efficiency – individuals with higher patience tend to live in homes with higher energy efficiency. This is in line with *Newell/Siikamäki* (2015) who find that individuals with higher discount rates, meaning individuals with less patience, are less willing to pay for energy efficiency. Individual electricity consumption in general seems also affected by time preferences. In this regard, *Groh/Ziegler* (2022) show that more patient individuals tend to consume less electricity and *Werthschulte/Löschel* (2021) provide evidence for less electricity consumption of survey participants who are not present-biased. Besides time preferences, *Fischbacher et al.* (2021) find that risk-lovingness seems to have explanatory power as well. A risk loving homeowner rather takes renovation measures to increase her home's energy efficiency. Moreover, *Farsi* (2010) argues that an individual's increased degree of risk aversion regarding investments into energy efficiency might depend on too little information on the return. Likewise, individual loss perception affects the preference for energy

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efficiency. Specifically, *Heutel* (2019) shows that higher loss aversion tends to decrease the probability of investing in energy efficiency measures.

We complement this literature by investigating the relation between people's demographics, their regional identity and economic, time, and sustainability preferences and their demand for regional sustainable energy. Moreover, we examine people's expectations regarding (regional) co-benefits related to a decentralization of electricity production and their interest in regional electricity. For this purpose, we carried out an online survey that generated a population sample consisting of 1,200 respondents. As the sample's composition is representative for the German population along gender, age and state of residence, we can draw a comprehensive picture of individual attitudes towards regional sustainable energy consumption in the German society.

Using parametric analyses allows us to identify various relations between the preferences for regional energy and interviewees' characteristics. Specifically, we first analyze the effects of a respondent's gender, age, and education. Our findings suggest that higher education is positively associated with a respondent's preference for regional electricity while females are more interested in regional sustainable electricity than males. Secondly, we include people's regional identity and their economic, time, and incentivized sustainability preferences into the regression analyses to find out which types of individuals are more eager to adapt regional electricity contracts. Generally, respondents' regional identity constitutes a significant driver of the demand for regional energy. In addition, we find that the measures for altruism, patience and sustainability tend to positively affect the general preference for regional sustainable electricity. Finally, our analyses show that our respondents' perception of regional co-benefits is strongly associated with their willingness to use a regional electricity tariff. Generally, the findings suggest that the demand for regional energy is highly dependent on the subjects' characteristics. Based on our results, certain groups might be approached with targeted information to further promote social acceptance towards the exploitation of regional sustainable electricity production capacities.

This paper is structured as follows. The next section gives a brief overview on the sample's general composition and provides a descriptive summary of the data. Section 3 specifies a basic model that is used for the regression analyses. Moreover, section 3 presents the regression analyses' results. Lastly, section 4 discusses the results and concludes.

2 Sample and Descriptive Statistics

Within the scope of an online survey conducted by a professional market research company that was carried out during the last two weeks of March 2021, a total of 1,200 individuals were interviewed. First, the respondents provided information on their demographics such as gender, age, and education. Those demographics are presented in detail in section 2.1. Section 2.2 proceeds by presenting the sample's preferences for regional electricity. This is followed by sections 2.3 and 2.4 that introduce factors that we expect to explain people's preferences for regional energy. Specifically, section 2.3 provides an overview on the sample's risk, altruism, and time preferences in addition to an incentivized donation question that aims to measure a respondent's attitude towards sustainability. Section 2.3 reviews the respondents' sense of regional identity and their perception of regional co-benefits associated with regional electricity.

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2.1 Demographics

Table 1 summarizes the demographics of our sample. The representative sample consists of 593 male respondents, 606 female respondents, and 1 respondent that stated to be divers. With 26 %, the largest share of the sample is 50 to 59 years old, followed by 20 % of the respondents being 40 to 49 years old. The remaining shares of respondents are 18 to 29 (17 %), 30 to 39 (18 %), and 60 to 69 (19 %) years old, respectively. The average age in our sample is 46 years. Most of the respondents, that is 38 %, hold a secondary school diploma (German: "*Realschulabschluss*") as the highest educational degree. The remaining participants distribute as follows on the education levels: 24 % hold a university qualifying certificate (German: "*Abitur*"), 25 % hold a university degree, 13 % completed the German "*Hauptschule*", and 3 respondents stated to not hold any of these educational certificates. All demographic characteristics thus by and large follow the same patterns as the general German population, with a tendency towards a somewhat higher level of education (*Statistisches Bundesamt* 2021a; *Statistisches Bundesamt* 2021b; *Statistisches Bundesamt* 2021c).

Descriptive Statistics

Gender	Absolute	Percent	Cumulative
Female	606	51 %	51 %
Male	593	49 %	100 %
Divers	1	0 %	100 %

Age	Absolute	Percent	Cumulative
18 – 29 years	207	17 %	17 %
30 – 39 years	219	18 %	35 %
40 – 49 years	237	20 %	55 %
50 – 59 years	305	26 %	81 %
60 – 69 years	232	19 %	100 %

Education	Absolute	Percent	Cumulative
No Degree	3	0 %	0 %
Lower Secondary School Leaving Certificate ("*Hauptschule*")	152	13 %	13 %
Secondary School Leaving Certificate ("*Realschule*")	458	38 %	51 %
University Qualifying School Certificate ("*Abitur*")	293	24 %	75 %
University Degree	294	25 %	100 %

Table 1: Descriptive Statistics

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2.2 Preferences for Regional Sustainable Electricity

We aim to investigate people's preference for regional sustainable electricity. For this purpose, the survey included a question that asked for a respondent's preference for *regional* sustainable electricity compared to an alternative sustainable energy contract. In case of the alternative contract, consumers were not informed about the electricity's geographical origin. This regional-energy-preference question was answered on a 7-point scale where a value of 7 indicates a high preference for regional electricity compared to the alternative sustainable electricity contract.[1]

In our sample, we observe that 42 % indicate a preference of at least 6 for receiving regional sustainable energy rather than standard sustainable energy, suggesting that the preference for regional electricity is rather strong. In the following, we want to better understand the preferences for regional electricity by investigating the determinants of these preferences with a particular focus on individual preferences, regional identity and expected regional co-benefits of regional energy production.

2.3 Economic, Time, and Sustainability Preferences

In general, economic, time, and sustainability preferences have powerful influences on a broad variety of socioeconomic phenomena. *Hansen/Legge* (2016) find that altruistic preferences increase the support for immigration. Moreover, altruism seems to be significantly related to individual personality traits such as extraversion or openness (*Furnham et al.* 2016). While higher risk aversion impedes the adoption of innovative technologies in the agricultural sector (*Knight et al.* 2003; *Yoo/Chavas* 2021), individual cognitive ability constitutes an essential driver of risk aversion itself and, additionally, of impatience (*Dohmen et al.* 2010; *Lilleholt* 2019). Moreover, very prominent phenomena associated with impatience are observed inefficiencies in individual saving decisions for retirement (*Laibson* 1997). Regarding preferences for sustainability, the provision of information constitutes an essential influence factor. *Shrum* (2021) shows that providing information on future risks of climate change significantly increases individual willingness to donate for climate change mitigation. This is generally in line with *Reichl et al.* (2021) who argue that better communication could improve individual climate protection actions. The above presented interconnections are only a brief glimpse on the vast amount of research that has been carried out to investigate the determinants of individual preferences and their role in real-world situations. In general, this highlights the importance of individual preferences.

Accordingly, within the scope of the online survey, we queried four preference measures, regarding altruism, risk, patience, and sustainability by including one question for each factor.[2] Altruism, risk, and time preferences have been queried by a 7-point scale where respondents could indicate their willingness to share with others without expecting anything in return, take risks, or invest into their future by giving something up today. This

1 Our data shows that 11 % of our sample already use an electricity contract that provides regional electricity. 38 % use a contract from their basic supplier, 29 % have a sustainable electricity contract, and 23 % found their contract via price comparison.

2 Appendix 1.4 provides a detailed overview on the questions used for elicitation.

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methodology is inspired by other studies that are based on the *Socio-Economic Panel*[3] (e.g., *Dohmen et al.* (2011) and *Falk et al.* (2018)). Being altruistic, risk seeking, or patient could be indicated by choosing the maximum value of up to 7 points. In contrast, respondents that self-assessed as selfish, risk averse, or impatient chose the minimum value of 1 point. To determine the sample's preference for sustainability, we confronted the respondents with a donation decision. Specifically, we first endowed each respondent with 12 Euros. Then we asked how much of the 12 Euros a respondent was willing to donate for a project that promotes climate protection. The amount of the 12 Euros that was not chosen to be donated could be kept by the respective respondent.[4]

With a median value of 5 out of 7 points, most subjects indicate to be rather altruistic. Specifically, only 8 % indicate that they would not be willing to share with others without expecting something in return (1 – 3 points). While 17 % are indifferent (4 points), the remaining 75 % are willing to share without expecting a return (5 – 7 points). The risk question's (Q2) median value of 4 out of 7 points suggests risk neutrality among our respondents. However, besides the 23 % of respondents that state to be risk neutral (4 points), the data rather shows risk aversion with 50 % of the sample which are not willing to take risks (1 – 3 points). In contrast, only 27 % of the respondents are rather willing to take risks (5 – 7 points). A median value of 5 out of 7 points regarding Q3 indicates patience. 8 % of the sample is not willing to give something up today for receiving a return in future (1 – 3 points), 17 % are time neutral (4 points), and with 75 %, most of our respondents are willing to invest into their future (5 – 7 points). The sample's preference for sustainability is expressed by a mean donation of 4.30 Euros and a median value of 3 Euros out of 12 Euros. Even though survey instruments differ, our results are largely in line with other studies analyzing representative samples, as they likewise find their respondents to be risk averse (*Dohmen et al.* 2011; *Fischbacher et al.* 2021; *Ziegler* 2021; *Groh/Ziegler* 2022) and patient (*Ziegler* 2020; *Fischbacher et al.* 2021; *Ziegler* 2021; *Groh/Ziegler* 2022). Our included qualitative self-assessment question targeting altruism indicates stronger social preferences of our respondents compared to studies which use dictator or generosity games as survey instruments (*Ziegler* 2020; *Fischbacher et al.* 2021; *Ziegler* 2021). However, the *Global Preference Survey* (GPS), that has been used to analyze economic and time preferences in a global context (*Falk et al.* 2018), queries altruism, inter alia, in a similar fashion as we did within our survey. We measure our sample's preference for sustainability in a less standardized way compared to the former individual preferences, so that a comparison of the results with other studies is less straight forward. However, as in our study, it seems common for respondents to donate a substantial share of their monetary endowment to pro-environmental organizations when having the choice to do so (*Svenningsen* 2019, *Andre et al.* 2021).

3 The *Socio-Economic Panel* (*SOEP*) is a large multidisciplinary household survey, constructed by the *German Institute for Economic Research* in Berlin (*DIW* Berlin). Every year, approximately 30,000 people in 15,000 households are interviewed for economic research as part of the *SOEP* study.

4 The data presented here are part of a larger questionnaire that also involved other parts on the co-benefits of sustainable behavior and people's willingness to intervene in others' sustainable choices. In the present study, we mainly focus on the questions that deal with preferences for regional energy, but we also make use of the incentivized donation measure on sustainable preferences and interviewees' regional identity. Only a random subsample of our participants was actually paid out.

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2.4 Regional Identity and Regional Co-Benefits

Previous scientific literature has generated implications regarding co-benefits and their role in energy, climate, and environmental issues. Specifically, many studies focus on the association of economic and social co-benefits associated with CO_2 mitigation policies or potential pathways. Studies focusing on China's effort to reduce CO_2 emissions generally find that such efforts would generate extensive co-benefits, particularly related to an improved health of the population, e.g., due to less air pollution (*Aunan et al.* 2004; *Mao et al.* 2012; *Dong et al.* 2015). *Löschel et al.* (2021) conclude in a study for Beijing that a substantial part of the revealed demand for voluntary climate change mitigation is driven by concerns for local co-benefits of CO_2 emissions reduction. In turn, the health system's discharge could result in reduced costs which could entirely compensate or even exceed the costs for CO_2 mitigation (*Li et al.* 2018; *Tang et al.* 2022). Moreover, some scientific work has investigated potential associations of providing information on co-benefits of emission reduction programs or policies and the individual willingness to engage in climate change mitigation. Such studies basically find that providing information on co-benefits related to CO_2 abatement can significantly increase the motivation to individually take action against climate change (*MacKerron et al.* 2009; *Longo et al.* 2012; *Svenningson* 2019; *Feldhaus et al.* 2022). *Bartels et al.* (2021), for example, studied the active communication of co-benefits for a reforestation project in Germany. As co-benefits are expected to be positively correlated with spatial distance to the local carbon sink, they provide an in-depth analysis on the impact of spatial variation on the individual willingness to pay. They found that while spatial distances affect the likelihood to contribute to a local carbon sink, it does not affect the average amount given.

Most of the literature on co-benefits has focused on the direct association with CO_2 abatement or climate change mitigation. However, there is only little evidence regarding co-benefits related to the exploitation of regional electricity production capacities. Thus, we aim to investigate whether the perception of regional co-benefits matter for the individual acceptance of regional energy. For this purpose, we construct a measure that consists of our respondents' perceived importance of three co-benefits related to regional electricity. Specifically, we take the rounded average of the points attributed by our respondents to each of the three statements '*I think that my region profits economically from higher production of ecological electricity in my region.*', '*I think that regional electricity production strengthens the region's community sense.*', and '*In my view it is important that the increasing usage of regional electricity reduces the construction of transmission powerlines.*'. Our respondents could express their consent on a 7-point Likert scale where 1 expresses no consent and 7 indicates high consent with a specific statement. Accordingly, our new measure ranges from 1 to 7 points. We observe that co-benefits associated with regional electricity are slightly positively perceived by our respondents, as expressed by a median value of 5 out of 7 total points. In detail, for 13 % of our sample, the co-benefits of regional electricity production play a subordinate role (1–3 points), 26 % are indifferent (4 points), and 61 % perceive such co-benefits as rather or highly important (5–7 points). Moreover, we queried our respondents' connection to their region as we assume regional identity to be a crucial driver of the individual acceptance of regional electricity production. Again, on a 7-point Likert scale, respondents could indicate a low connection (1–3 points), indifference (4 points), or a high connection with

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their region (5–7 points). Generally, our sample exhibits a strong regional identity as the median takes a value of 6 out of 7 total points.

3 Regression Analysis

To test for potential relations between demographics and economic preferences as well as people's regional identity and their expected regional co-benefits and the interest in regional electricity, we use an in-depth parametric analysis. We find several significant relations indicating high explanatory power of some of the variables regarding people's interest in regional electricity. The following sub-section 3.1 specifies a basic model that is used for identifying potential relations. Section 3.2 summarizes the results.

3.1 Model

We use a simple multiple regression model, as illustrated by equation (1), to identify potential relations among our dependent and independent variables. Specifically, we regress our sample's interest in regional sustainable over standard sustainable electricity on the standard demographics, that is gender, age, and education and, moreover, sequentially include our respondents' economic, time, and sustainability preferences, their regional identity, and their expected regional co-benefits of regional electricity in the regression analysis.

$$(1) \quad Y_i = \gamma_0 + \gamma_1 SD_i + \gamma_2 RegId_i + \gamma_3 IP_i + \gamma_4 CoBen_i$$

The dependent variable Y_i is a respondent's preferences for a sustainable regional over a sustainable or green electricity contract on the 7-point scale. Section 2.2 provides descriptive information on this measure's composition. The independent variables are summarized by four vectors. Vector SD_i consists of a respondent's standard demographics, that is gender, age, and education. Simultaneously, vector IP_i summarizes the respondents' individual economic, time, sustainability, and regional preferences. We first investigate potential effects of the respondent's standard demographics on the dependent variable. Secondly, while controlling for SD_i, we consider the vector IP_i for including individual economic, time, and sustainability preferences of our respondents. Besides our sample's standard demographics and individual preferences, we include our respondents' regional identity and the expected-co-benefits measure. $RegId_i$ captures our respondents' regional identity and $CoBen_i$ is the measure for the co-benefits associated with regional electricity production.

We carry out a total of five estimation runs with the outputs being summarized by Table 2. The first specification (1) of Table 2 includes our sample's standard demographics, SD_i, while specification (2) extends the regression analysis by integrating our sample's regional identity $RegId_i$. Specification (3) only includes the standard demographics SD_i and individual economic, time, and sustainability preferences IP_i. Specification (4) provides an output where, besides the standard demographics SD_i our sample's regional identity $RegId_i$ and individual preferences IP_i are included. Specification (5) summarizes the results of the full model where SD_i, $RegId_i$, IP_i, and the co-benefits measure $CoBen_i$ are all included.

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VARIABLES	(1) Regional vs. Green	(2) Regional vs. Green	(3) Regional vs. Green	(4) Regional vs. Green	(5) Regional vs. Green
Female	0.31***	0.33***	0.18**	0.22**	0.20**
	(0.10)	(0.09)	(0.09)	(0.09)	(0.08)
Age	0.00	0.00	0.01**	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Education	0.10**	0.13***	0.04	0.06	0.06
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)
Regional Identity		0.22***		0.16***	0.09***
		(0.03)		(0.03)	(0.02)
Sustainability			0.08***	0.08***	0.03***
			(0.01)	(0.01)	(0.01)
Altruism			0.17***	0.13***	0.08**
			(0.04)	(0.04)	(0.03)
Patience			0.17***	0.15***	0.03
			(0.04)	(0.04)	(0.03)
Risk			0.05	0.05	0.00
			(0.03)	(0.03)	(0.03)
Regional Co-Benefits					0.63***
					(0.03)
Constant	4.25***	3.11***	2.15***	1.59***	0.53*
	(0.26)	(0.30)	(0.33)	(0.34)	(0.30)
Observations	1,200	1,200	1,200	1,200	1,200
R-squared	0.01	0.06	0.13	0.15	0.38

Standard errors in parentheses, significance: *** p<0.01, ** p<0.05, * p<0.1

Table 2: Results of the Regression Analysis, Acceptance Score (Regional Sustainable Electricity over Sustainable Electricity) as Dependent Variable (Measured on a 7-Point Scale)

Our respondents could indicate their respective preferences on a 7-point scale where 7 points imply a high preference for the regional electricity contract and 1 point for the alternative green contract. Female and higher educated respondents seem to be generally in favor of regional electricity compared to traditional sustainable electricity contracts, as summarized by specification (1) of Table 2. Compared to other genders in our sample, females' preference is about 0.31 points higher on our 7-point scale. Also, the higher educated subjects are significantly more in favor of regional electricity. Age does not significantly affect the preference score in case of regional versus green electricity contracts. Specification (2) further suggests that also people's regional identity is strongly and positively related to their preferences for regional electricity.

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Regarding economic preferences, while controlling for standard demographics, our results suggest strong significant relations between our sample's preference for sustainability, altruism, and patience and the dependent variable. Specifically, more sustainable, prosocial, or patient respondents tend have a significantly larger preference for regional sustainable electricity. In contrast, our respondent's willingness to take risks does not significantly affect the preference for regional electricity.

Finally, our sample's regional identity seems to crucially affect the demand for regional sustainable electricity, as shown for example in specification (3). Here, an additional point on the individual's scale regarding their regional identity results in an 0.22-point increase in the support for regional energy. The effect remains significant when including individual preferences and the co-benefits measure, however, decreases in size in specifications (4) and (5). Specification (4) provides evidence on the effects of individual preferences on the acceptance towards regional sustainable electricity while controlling for the sample's regional identity. The basic interpretation and significance levels of the effects' directions are very similar to the results illustrated in specification (3). Eventually, specification (5) shows the results when including the measure for expected co-benefits related to regional electricity production. The measure's effect is positive and highly significant, suggesting that expectations regarding co-benefits are crucial when it comes to the support of a decentralized energy system.

4 Discussion and Conclusion

We investigated people's preference for regional electricity. For this purpose, we carried out a Germany-representative online survey consisting of 1200 respondents. Besides standard demographics, the sample provided information on their acceptance of regional electricity. Additionally, we asked for a respondent's economic preferences. Specifically, the willingness to take risks, patience, altruism, and sustainability have been identified by including four corresponding questions in the survey. Our respondents self-stated their risk, time, and altruism preferences on a 7-point Likert-Scale similar to *Dohmen et al.* (2011) and *Falk et al.* (2018).[5] Our sample's preference for sustainability has been elicited by an incentivized donation decision as in *Svenningsen* (2019) or *Andre et al.* (2021).

To investigate the role of those economic, time, and sustainability preferences in the demand for regional electricity, we carried out in-depth parametric analyses. In general, our results suggest that, in most cases, our observed preferences have substantial influence on our sample's preferences for regional sustainable electricity. We make five main observations that can be summarized as follows. First, we observe that a higher preference for sustainability, as measured by an incentivized donation decision, positively affects the demand for regional sustainable electricity, also compared to conventional green electricity contracts. This finding suggests that an increased social consciousness for the environment and expected urgence for taking action against climate change may boost regional sustainable electricity demand. As investigated by *Shrum* (2021), the provision of information in this regard can significantly increase the preference for sustainability, and, accordingly,

5 There are many ways of eliciting economic preferences (e.g., making use of incentivized multiple price lists), which may lead to different results. Though, for the case of individual time preferences, the results of *Brañas-Garza et al.* (2020) suggest that any of these differences in the way of measuring economic preferences does not seem to be systematic.

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the demand for regional electricity. Second, our results suggest that higher altruism likewise increases the demand for regional electricity. Specifically, more altruistic respondents tend to exhibit a higher preference for regional electricity. Third, we shed light on the importance of time preferences on the demand for regional electricity. According to our findings, higher patience among the respondents tends to increase the preference for regional electricity. Fourth, we find no evidence that our sample's willingness to take risks is relevant for the demand for regional electricity. Fifth, we observe the importance of regional factors. Specifically, a stronger regional identity and a higher valuation of the expected (regional) co-benefits are strongly associated with people's preference for regional energy.

Generally, our findings suggest that a more sustainable, prosocial, patient society with strong regional identity may be more receptive and sympathize more with the concept of a decentralized sustainable electricity production. Specifically, a society with such traits could, according to our conclusion, exhibit a higher demand for regional sustainable electricity. Therefore, among others, the provision of information strengthening regional identities and pointing at the associated co-benefits may be promising strategies to foster the demand for and support of regional electricity.

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Appendix A – Survey Questions and Statements (in English and German)

This appendix provides information on the survey questions and statements that have been used to query our sample's standard demographics, the preference for regional sustainable electricity over sustainable electricity, the perception of expected co-benefits associated with regional electricity, and our respondents' individual preferences and regional identity. We provide an English translation, but all questions and statements are additionally accompanied by the original German language format that has been used in the online survey.

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Appendix A.1 Standard Demographics

GENDER

[ENG] Please state your gender:

Male
Female
Diverse

[GER] Bitte geben Sie Ihr Geschlecht an:

Männlich
Weiblich
Divers

EDUCATION

[ENG] What is your highest educational degree?

No Degree
Lower Secondary School Leaving Certificate
Secondary School Leaving Certificate
University Qualifying Certificate
University Degree

[GER] Welcher ist Ihr höchster Bildungsabschluss?

Ohne Abschluss
Hauptschule
Realschule
Abitur
Hochschulabschluss

AGE

[ENG] How old are you?

Integer between 18 and 69

[GER] Wie alt sind Sie?

Integer zwischen 18 und 69

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Appendix A.2 Current Tariff and Preference for Regional Sustainable Electricity

CURRENT ELECTRICITY CONTRACT	
[ENG] Which of the following electricity contracts describes your current contract best?	
	Standard contract at basic supplier
	Cheaper provider from price comparison
	Sustainable electricity contract
	Regional electricity contract
[GER] Welcher der folgenden Stromtarife beschreibt Ihren aktuellen Tarif am besten?	
	Standardtarif beim Grundversorger (z. B. lokales Stadtwerk)
	Günstiger Anbieter aus dem Preisvergleich
	Ökostrom-Tarif
	Regionalstrom-Tarif

PREFERENCE FOR REGIONAL SUSTAINABLE ELECTRICITY VS. GREEN ELECTRICITY	
[ENG] How much do you agree with the statement: In principle, I would prefer regional sustainable electricity over usual green electricity?	
	1 = No consent at all
	2
	3
	4
	5
	6
	7 = Very high consent
[GER] Wie sehr stimmen Sie der Aussage zu: Grundsätzlich würde ich regionalen Ökostrom gegenüber üblichem Ökostrom bevorzugen?	
	1 = Überhaupt keine Zustimmung
	2
	3
	4
	5
	6
	7 = Sehr große Zustimmung

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Appendix A.3 Expected Regional Co-Benefits

We assigned four statements to the measure illustrating our respondents' perception of expected co-benefits associated with regional sustainable electricity production. Simultaneously to the question eliciting a respondent's preference for regional over green electricity (Appendix 1.2), the degree of consent to a statement could be indicated on a 7-point Likert scale where 1 point expresses "no consent at all" and 7 points express "very high consent".

EXPECTED REGIONAL BENEFITS

[ENG] I think that my region profits economically from higher production of ecological electricity in my region.

1 = No consent at all
2
3
4
5
6
7 = Very high consent

[GER] Ich denke, dass meine Region wirtschaftlich davon profitiert, wenn mehr ökologischer Strom in der Region produziert wird.

1 = Überhaupt keine Zustimmung
2
3
4
5
6
7 = Sehr große Zustimmung

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EXPECTED REGIONAL BENEFITS

[ENG] In think that regional electricity production strengthens the region's community sense.

1 = No consent at all
2
3
4
5
6
7 = Very high consent

[GER] Ich denke, dass durch die regionale Stromproduktion der Gemeinschaftssinn gefördert wird.

1 = Überhaupt keine Zustimmung
2
3
4
5
6
7 = Sehr große Zustimmung

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EXPECTED REGIONAL BENEFITS

[ENG] In my view it is important that the increasing usage of regional electricity reduces the construction of transmission powerlines.

1 = No consent at all
2
3
4
5
6
7 = Very high consent

[GER] Ich finde es wichtig, dass durch vermehrte Nutzung von Regionalstrom weniger Überlandleitungen für Strom ausgebaut werden müssen.

1 = Überhaupt keine Zustimmung
2
3
4
5
6
7 = Sehr große Zustimmung

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Appendix 1.4 Economic Preferences and Regional Identity

ALTRUISM PREFERENCES

[ENG] How would you rate your willingness to share with others without expecting anything in return?

1 = Not willing at all
2
3
4
5
6
7 = Very willing

[GER] Wie schätzen Sie Ihre Bereitschaft ein, mit anderen zu teilen, ohne dafür eine Gegenleistung zu erwarten?

1 = Gar nicht bereit
2
3
4
5
6
7 = Sehr bereit

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RISK PREFERENCES

[ENG] How do you rate yourself personally? Are you generally a risk-taker or do you try to avoid risks?

1 = Not willing at all
2
3
4
5
6
7 = Very willing

[GER] Wie schätzen Sie sich persönlich ein? Sind Sie im Allgemeinen ein risikobereiter Mensch oder versuchen Sie, Risiken zu vermeiden?

1 = Gar nicht bereit
2
3
4
5
6
7 = Sehr bereit

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TIME PREFERENCES

[ENG] Compared to others, are you generally willing to give up something today in order to benefit from it in the future, or are you unwilling to do so compared to others?

1 = Not willing at all
2
3
4
5
6
7 = Very willing

[GER] Sind Sie im Vergleich zu anderen im Allgemeinen bereit, heute auf etwas zu verzichten, um in der Zukunft davon zu profitieren, oder sind Sie im Vergleich zu anderen dazu nicht bereit?

1 = Gar nicht bereit
2
3
4
5
6
7 = Sehr bereit

SUSTAINABILITY PREFERENCES

[ENG] I donate the following amount to the project, which stands up for climate protection by promoting renewable energy:

Integer between 0 and 12

[GER] Dem Projekt, das sich durch die Förderung von erneuerbaren Energien für den Klimaschutz einsetzt, spende ich folgenden Betrag:

Integer zwischen 0 und 12

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REGIONAL IDENTITY

[ENG] How connected do you feel to the region in which you live?

1 = Less connected
2
3
4
5
6
7 = Very connected

[GER] Wie sehr fühlen Sie sich mit der Region, in der Sie wohnen, verbunden?

1 = Weniger verbunden
2
3
4
5
6
7 = Sehr verbunden

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