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September 2018

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Abstract

Based on data from a large-scale computer-based survey among more than 3700 German citizens, this paper empirically disentangles the determinants of the general change of electricity contracts and the specific change to green electricity contracts. Our econometric analysis reveals a strong relevance of behavioral factors and individual values and norms. For example, patience (which was measured by an incentivized experiment included in the survey) has a significantly positive effect on both general switches to alternative electricity contracts and specific switches to green electricity contracts. Furthermore, trust and (less robust) social preferences (also measured by an incentivized experiment) have additional significantly positive effects on the specific change to green electricity contracts. Our estimation results also imply an important role of political identification, i.e. an ecological policy orientation is strongly significantly positively correlated with the change to green electricity contracts. Furthermore, several household specific factors like relocation decisions as well as socio-demographic and socio-economic variables like household income are also relevant. The empirical analysis thus provides new explanation patterns for the phenomenon that relatively few households regularly change their electricity contracts and specifically switch to green electricity contracts, although they have high stated preferences for such changes. Our insights suggest several directions for policy and electricity suppliers to increase these switching rates. For example, the high importance of trust for the change to green electricity contracts suggests transparency initiatives of electricity suppliers to decrease concerns against renewable energies.

JEL classification: A13, C93, D12, D91, Q41, Q42, Q50

Keywords: Switching electricity contracts, green electricity, behavioral factors, artefactual field experiments, individual values and norms

1. Introduction

After several energy market liberalizations, households in many countries are able to freely choose their electricity contracts (e.g. Sirin and Gonul, 2016). While the reduction of energy costs is one of the main reasons for the change of electricity contracts, other reasons like the demand for renewable energies may also be relevant. In spite of high stated preferences for electricity contract changes, however, only a small number of households regularly uses this possibility (e.g. He and Reiner, 2017). A good example are switches to green electricity contracts. While a large majority of households in the USA and European countries states to favor renewable energies and is even willing to pay a premium for it (e.g. Pichert and Katsikopoulos, 2008), the choice of corresponding electricity contracts is indeed increasing, though still very limited, even in countries like Germany with a high share of electricity from renewable energy sources (e.g. Bundesnetzagentur and Bundeskartellamt, 2017). This can obviously lead to inefficiencies if households do not fully consider possible cost savings that are associated with electricity contract changes or do not comply with their own preferences. An insufficient change to green electricity contracts can additionally lead to externalities if households do not internalize benefits from green electricity generation for other individuals.

According to Fehr-Duda and Fehr (2016), a main barrier for the individual change to alternative electricity contracts is the reluctance or inability to evaluate the large number of different electricity suppliers and tariffs. Changes of electricity contracts are associated with transaction costs including search and information costs. While for most individuals a necessary economic condition for a change is that all benefits of switching exceed the costs, errors in the perception of benefits and costs, i.e. an underestimation of the benefits and an overestimation of the costs, can obviously discourage the change of electricity contracts (e.g. Ek and Söderholm, 2008, He and Reiner, 2017). In this respect, it can be assumed that households are heterogeneous with respect to the aforementioned perceived benefits and costs. On this basis, Schleich et al. (2018) consider behavioral factors (i.e. time and risk preferences) for changes of electricity contracts. Similarly, by analyzing the change to a time-of-use electricity pricing program as an example for a specific electricity contract, Qiu et al. (2017) argue that behavioral factors can cause the under-participation in such cost-reducing contracts.

Against this background, this paper empirically examines how heterogeneity in individual preferences affects differences in switching to alternative electricity contracts. The

contribution of the study is threefold: First, it contributes to the literature on the general change of electricity contracts by considering a large number of possible determinants. Most previous econometric analyses in this field consider a limited number of factors (e.g. Ek and Söderholm, 2008, Wilson and Waddams Price, 2010, He and Reiner, 2017), only examine changes of electricity suppliers (but not to alternative electricity contracts without changing the current suppliers) (e.g. Wilson and Waddams Price, 2010, He and Reiner, 2017), or refer only to switches to one specific electricity contract (e.g. Qiu et al., 2017). Similar to Schleich et al. (2018), we instead examine general changes of electricity contracts and especially a wide range of household specific factors such as relocation decisions or housing ownership and common socio-economic and socio-demographic variables.[1] Furthermore, we additionally consider factors from behavioral economics like time and social preferences and (in contrast to Schleich et al., 2018) several individual values and norms (i.e. environmental values, political orientation, religious affiliation).

Second, since our identification of time and social preferences is based on artefactual field experiments (e.g. Levitt and List, 2009, List, 2011), our empirical analysis contributes to previous studies (e.g. Dohmen et al., 2011, Fischbacher et al., 2015) that mimic laboratory experiments in the field by considering incentivized measures in a large-scale survey among more than 3700 German citizens. By additionally considering risk preferences and trust attitudes, we contribute to the more general broad literature that examines economic effects of these behavioral factors. For example, previous studies identify the relevance of aggregate measures of trust for several macroeconomic variables like GDP growth, inflation, or the volume of trade between countries (see e.g. the overview in Fehr, 2009). At the individual level, it is, for example, shown that trust plays an important role for buying stocks (e.g. Guiso et al., 2008). Similarly, previous studies reveal the importance of risk preferences for behaviors and outcomes such as buying stocks, housing ownership, or patterns of occupational choice (see e.g. the overview in Dohmen et al., 2012) as well as the relevance of time preferences for lifetime outcomes such as income or unemployment (e.g. Golsteyn et al., 2014) or even for cognitive abilities (e.g. Dohmen et al., 2010). While Qiu et al. (2017) and Schleich et al. (2018) also examine time and risk preferences, to the best of our knowledge, these four behavioral factors have not been jointly related to electricity contract changes so far.

[1] Flores and Waddams Price (2018) also consider a wide range of socio-economic and socio-demographic variables, but focus on the relevance of general attitudes to markets and of information and marketing variables in their analysis of changes to alternative electricity suppliers. In addition, they also examine searches of alternative electricity suppliers.

Third, by additionally analyzing specific changes to green electricity contracts, we also contribute to the large literature on preferences for renewable energies. Most previous studies in this field examine the willingness to pay for green electricity on the basis of stated preferences data (see e.g. the meta-analysis of Sundt and Rehdanz, 2015) and especially on the basis of stated choice experiments (e.g. Amador et al., 2013, Murakami et al., 2015). Only a few of these studies (e.g. Tabi et al., 2014) analyze the relevance of several individual variables including some behavioral factors for the choice among several electricity contracts so far. However, common behavioral factors like time preferences have, to the best of our knowledge, not been considered until now. In contrast to most previous studies (an important exception is Kotchen and Moore, 2007, who also examine the effect of social preferences), our empirical analysis is furthermore based on actual instead of stated switches to (green) electricity contracts. In order to maximize the reliability of the corresponding answers, we did not ask the participants of the survey for the (green) properties of their current electricity contracts, but asked them to indicate the electricity supplier and tariff directly from the last electricity bill. On this basis, we thoroughly examined whether the current electricity contract is completely green or not so that the change to alternative green or non-green electricity contracts can be reliably identified.

In fact, our econometric analysis with binary probit and multinomial logit models reveals a strong relevance of heterogeneous preferences. For example, lower discount rates and thus a higher patience have a significantly positive effect on both general changes to alternative electricity contracts and specific changes to green electricity contracts. This suggests that rather impatient citizens perceive the costs for evaluating different electricity suppliers and tariffs as too high so that their willingness to change the electricity contracts is restricted. For specific switches to green electricity contracts, two further behavioral factors, i.e. social preferences and especially trust, are also relevant. With respect to the latter factor, this suggests that trust in the electricity supplier and the quality of the product is important in the case of green electricity. Our estimation results also imply an important role of political identification, i.e. an ecological policy orientation is significantly positively correlated with the change to green electricity contracts. Furthermore, several household specific factors like relocation decisions or housing ownership as well as common socio-demographic and socio-economic variables like household income also significantly affect the change to alternative electricity contracts.

The remainder of the paper is organized as follows: Section 2 discusses the conceptual background of our study and develops several hypotheses that are examined in our empirical analysis. Section 3 presents the data and the variables in this econometric analysis as well as some descriptive statistics. Section 4 discusses the estimation results and Section 5 draws some conclusions.

2. Conceptual background and hypotheses

The change of electricity contracts is clearly associated with costs, such as search costs, learning and transaction costs, or cognitive decision-making costs (e.g. Wilson and Waddams Price, 2010, He and Reiner, 2017, Hortaçsu et al., 2017, Vesterberg, 2018). If the main reason to switch electricity contracts is the reduction of costs, a change can be considered as an investment since the costs arise immediately in the present, whereas the benefits (i.e. cost reductions) occur in the future. Therefore, it can be expected that time preferences are relevant in this respect. This argument can also be transferred to switches to those electricity contracts like green electricity contracts that are not necessarily associated with cost reductions in the future, but with search and transaction costs immediately in the present. The relevance of time preferences for energy-related behavior and preferences is already shown in previous empirical analyses (e.g. Epper et al., 2011, Fischbacher et al., 2015, Newell and Siikamäki, 2015). Furthermore, Qiu et al. (2017) reveal in their analysis of switching to a time-of-use electricity pricing program that time preferences also matter for the adoption of programmable thermostats that allow a better response to this program, but are associated with initial costs. In addition, Schleich et al. (2018) show for one of their indicator of time preferences (which is not based on an incentivized experiment) that patience has a positive effect on the change of electricity contracts. This leads to the following hypothesis that is examined in our econometric analysis:

> *Hypothesis 1: More patient individuals are more likely to change electricity contracts including changes to green electricity contracts.*

In the study of Qiu et al. (2017), however, time preferences have no significant effect on switches to the time-of-use electricity pricing program. Instead, they reveal a strong effect of risk preferences. This is in line with Schleich et al. (2018), who show that more risk-averse individuals change their electricity contracts to a lesser extent. Further studies

also show a high relevance of risk preferences for other energy-related behaviors if investments generate uncertain benefits in the future such as in the case of energy saving measures (e.g. Epper et al., 2011, Qiu et al., 2014, Fischbacher et al., 2015). While uncertain benefits in the future are obvious for changes of electricity contracts with time-variant pricing as in the case of the aforementioned time-of-use electricity pricing program, even a change to (cheaper) contracts with time-invariant pricing can have risks. In Germany, for example, several new electricity suppliers (which also offered green electricity contracts) went into insolvency (e.g. TelDaFax, FlexStrom), which led to high uncalculated costs for the customers. Therefore, it is plausible to think that risk preferences can be relevant for electricity contract changes. This example additionally suggests that trust attitudes (e.g. specific trust in the financial solidity of an electricity supplier) can be relevant for switches to alternative electricity contracts. Trust in the electricity supplier and the quality of the product seems to be especially important in the case of green electricity contracts if citizens with high preferences for renewable energies want to be certain that the electricity is really completely generated from renewable energy sources. This leads to the following two hypotheses that are examined in our econometric analysis:

> *Hypothesis 2: More risk-taking individuals are more likely to change electricity contracts including changes to green electricity contracts.*
>
> *Hypothesis 3: More trusting individuals are more likely to change electricity contracts including changes to green electricity contracts.*

While the three discussed behavioral factors might be relevant for both general electricity contract changes and specific switches to green electricity contracts, the latter can be influenced by further factors. In line with the study of Kotchen and Moore (2007) who examine the participation in two green electricity programs including changes to green electricity contracts, we consider such specific switches as a voluntary contribution to an (impure) public good, i.e. to a climate or more general environmental public good. It can be expected that individuals with higher social or fairness preferences draw a higher utility from their contribution to public goods, i.e. that they have a higher propensity to internalize externalities. Previous studies confirm this expectation for general public good contributions like donations (e.g. De Oliveira et al., 2012) and for specific energy efficiency measures (e.g. Fischbacher et al., 2015). In particular, Kotchen and Moore (2007) reveal a high relevance of social preferences (measured by an altruism scale) for the par-

ticipation in the two green electricity programs. This leads to the following hypothesis that is examined in our econometric analysis:

> *Hypothesis 4: Individuals with higher social preferences are more likely to change to green electricity contracts.*

While social preferences seem to be relevant for general public good contributions, it can be expected that environmental values additionally increase the individual utility from specific contributions to environmental and thus also climate public goods. Several previous studies confirm this expectation, for example, with respect to the reduction of electricity use (e.g. Kotchen and Moore, 2008, Delmas and Lessem, 2014), the probability to live in solar homes (e.g. Dastrup et al., 2012), carbon offsetting (e.g. Schwirplies and Ziegler, 2016), the willingness to pay higher prices for climate-friendly products (e.g. Ziegler, 2017), and especially the purchase of green electricity (e.g. Attari et al., 2009, who additionally consider the purchase of low emission vehicles) and the participation in two green electricity programs (e.g. Kotchen and Moore, 2007). This leads to the following hypothesis that is examined in our econometric analysis:

> *Hypothesis 5: Individuals with stronger environmental values are more likely to change to green electricity contracts.*

Another important individual value and norm for the contribution to climate or general environmental public goods is political identification. It can be expected that individuals adjust their behavior to their political orientation in order to comply with the rules and norms of a certain social category which is, for example, connected with the program of a political party. Several previous studies have revealed the high relevance of left-wing and especially ecological policy orientations, which is in line with the programs of corresponding parties. For example, Kahn (2007) shows a positive correlation between a Green Party membership and a low self-reported consumption of gasoline, the waiver of the possession of a SUV, and the use of public transit. Furthermore, Dastrup et al. (2012) show a positive correlation between voting for the Democratic, Peace and Freedom, and Green Parties and living in a solar home, Costa and Kahn (2013) show a negative correlation between registering for the Democratic and Green Parties and the consumption of electricity, and Schwirplies and Ziegler (2016) and Ziegler (2017) show a positive correlation between a green policy orientation and the willingness to pay higher prices for climate-friendly products. This leads to the following hypothesis that is examined in our econometric analysis:

Hypothesis 6: Individuals with left-wing and especially ecological policy orientations are more likely to change to green electricity contracts.

A final important individual value or norm for the contribution to climate or general environmental public goods is religious identity including religious affiliation. With respect to Christian religiosity, Cui et al. (2015) discuss two contradicting hypotheses about its correlation with pro-environmental behavior, namely the stewardship hypothesis that implies a positive correlation on the basis of teachings of the Christian religions and the dominion hypothesis that implies a negative correlation on the basis of the early work of White (1967) who suggests an anthropocentric worldview (e.g. Martin and Bateman, 2014) of Christianity. The empirical analysis of Cui et al. (2015) rather confirms the dominion hypothesis since firms with high regional shares of Christians and especially Protestants show less environmental practices. In contrast, Martin and Bateman (2014) find that Judeo-Christian religious values and norms have no significant effects on individual pro-environmental behavior, at least if several control variables are included in the econometric analysis. In total, this leads to the following two contradicting hypothesis that are examined in our econometric analysis:

Hypothesis 7a: Individuals with (Christian) religious affiliation are more likely to change to green electricity contracts.

Hypothesis 7b: Individuals with (Christian) religious affiliation are less likely to change to green electricity contracts.

3. Data and variables

The data for our empirical analysis were collected from a large-scale computer-based survey among 3705 German citizens, which was carried out in June and July 2016 by the German market research company Psyma. In order to avoid biased answers with respect to electricity contracts, we only included citizens in our survey who are alone or together with a partner responsible for the electricity decisions in the household, i.e. for the electricity bills and especially for the choice of electricity contracts. To consider relevant population groups after this filtering, the sample (which was drawn from a Psyma Panel) was stratified in terms of age, gender, place of residence, and religious affiliation so that

it is representative for these criteria.[2] The first part of the questionnaire referred to some screening questions including the identification of our target population of decision makers in the field of electricity. The second part of the questionnaire referred to personal values, norms, and attitudes including our behavioral factors and especially the two artefactual field experiments to identify time and social preferences. The next two parts referred to details in the electricity consumption and costs as well as to personal attitudes toward electricity and especially electricity generation. The fifth part of the questionnaire referred to a choice experiment with respect to different electricity contracts, which is, however, not considered in this paper. The final part referred to further socio-economic and socio-demographic variables. The median for the completion time of the survey was about 28 minutes.

3.1. Dependent variables

In order to examine changes of electricity contracts, the participants were asked how often they actively switched their electricity contracts within the last ten years (excluding automatic changes when moving out of the parental home to an own household). Based on categorical answer classes ("not at all", "once", "twice", and "more than twice"), we construct the dummy variable "change of electricity contracts" for the econometric analysis. It takes the value one if a respondent changed the electricity contract at least once. With respect to the identification of the current electricity contracts and thus switches to green or non-green electricity contracts, we asked the participants to pick up the last annual electricity bill and to indicate the electricity supplier and electricity tariff directly from it. On the basis of this information, we thoroughly examined whether the electricity contract is completely green. We expect that this procedure leads to a higher reliability for the identification of green or non-green electricity contracts than directly asking the participants for it since it is likely that many individuals are not able to recognize whether their electricity contracts are green or not. For the econometric analysis, we construct the dummy variable "change to green electricity contracts" that takes the value one if a respondent actively switched to a current green electricity contract within the last ten years. In addition, we consider the dummy variable "green electricity contracts" that takes the value one if the respondent currently has this type of electricity contract.

[2] However, this sampling strategy can lead to deviations for other criteria, for example, due to an overrepresentation of high education among individuals who are responsible for the electricity bills and the choice of electricity contracts.

Overall, 3620 out of the 3705 respondents provided usable indications of the electricity suppliers and tariffs, i.e. 85 respondents did not answer to the underlying question at all or provided fully incomprehensible answers.[3] However, among these 3620 indications, only 1974 electricity contracts can be directly and thus completely reliably derived from the answers. For the remaining 1646 electricity contract indications, different assumptions about their current green or non-green statuses are required. For 157 indications the assumptions are obvious and thus reliable since in these cases slightly incomplete electricity contract indications are simply completed or outdated electricity tariffs are substituted by their natural successors. 529 respondents only indicated the electricity suppliers, but not the electricity tariffs so that the standard tariffs for the corresponding electricity suppliers are assumed in these cases. 132 respondents only indicated municipal utilities as electricity suppliers, but did not specify them so that the electricity contracts are either derived from further indications or from the standard tariffs of the respective local municipal utilities. Finally, the remaining 828 respondents indicated electricity suppliers and tariffs, which are not completely unambiguous so that the most obvious assumptions about their current green or non-green statuses are made in these cases. In order to draw robust conclusions from our empirical analysis, we examine both the estimation results on the basis of 3620 observations with all available current electricity contract data and on the basis of the 1974 observations with more reliable electricity contract data.

The first two lines in Table 1 report the means and the standard deviations for the two dependent variables. In addition, the third line refers to the current electricity contracts. The left part of the table reveals that data for the general change of electricity contracts as well as for all explanatory variables as discussed below are available for all 3705 respondents. Therefore, the corresponding econometric analysis can be based on the full sample. According to the second line, the econometric analysis of specific switches to green electricity contracts can be based on data from 3639 respondents. The basis for these data refers to 3620 respondents as discussed above (see the third line) including 1646 respondents, for whom different assumptions about the statuses of their current electricity contracts are made. In addition, the value zero for "change to green electricity contracts" can be assigned to additional 19 respondents, who indicated that they did not actively switch their electricity contracts. The right part of Table 1 refers to the estimation sample for the specific change to green electricity contracts on the basis of the data

[3] Examples are indications of apparent suppliers which are no electricity suppliers or which only offer electricity to firms, but not to private customers.

for the 1974 respondents (see the third line), for whom reliable information about the current electricity contracts are available.[4] However, 2689 observations can be used for the econometric analysis since the value zero for the dependent variable "change to green electricity contracts" can be assigned to additional 715 respondents, who indicated that they did not actively switch their electricity contracts.

The left part of the table shows that more than 62% of the respondents switched their electricity contracts within the last ten years and almost 23% of the respondents switched to current green electricity contracts.[5] Since more than 29% of the respondents currently have green electricity contracts, this means that more than 6% of them did not actively switch to this contract within the last ten years.[6] The right part of the table reports a slightly higher mean for "green electricity contracts" and a slightly lower extent of changes to green electricity contracts, which is due to the inclusion of a considerable amount of zeros in this variable as discussed above. In order to assess our numbers, they can be compared with official data in the monitoring report of Bundesnetzagentur and Bundeskartellamt (2017).[7] This report reveals that in 2016, 9.6% of the German households switched their electricity contracts by simultaneously switching the electricity suppliers. In addition, 5.3% of the households changed it without changing the suppliers. However, it should be noted that these smaller numbers only refer to one year, whereas we analyze switches within ten years. The report also reveals that 22% of the German households had green electricity contracts in 2016, which is slightly lower than the share in our sample. However, with respect to the comparison of these numbers, it should be noted that our data are not completely representative due to our sampling strategy that only includes individual decision makers in the field of electricity, which could lead to slightly higher shares of electricity contract changers and switchers to green electricity contracts.

[4] For the econometric analysis with the dependent variable "change of electricity contracts" this restricted sample is not relevant.

[5] With respect to general switching rates, Schleich et al. (2018) provide very similar results, i.e. they report that almost 60% of the German respondents changed their electricity contracts within the last ten years.

[6] This group of respondents comprises, for example, those who switched to green electricity contracts more than ten years ago (and did not change the contract since then) or chose green electricity contracts when moving out of the parental home to an own household for the first time.

[7] The Bundesnetzagentur (Federal Network Agency) and the Bundeskartellamt (Federal Cartel Office) are required in accordance with section 63(3) in conjunction with section 35 of the Energy Act (EnWG) and section 48(3) in conjunction with section 53(3) of the Competition Act (GWB) to conduct joint monitoring activities in the electricity and gas sectors.

3.2. Behavioral factors

Our main explanatory variables refer to four behavioral factors. Time and social preferences were identified by two incentivized artefactual field experiments. For both experiments we informed the respondents that about 1% of them were randomly selected to be paid, respectively. Furthermore, we informed them that the winners are immediately notified after the survey and that the Euro amount is directly paid. In line with, for example, Dohmen et al. (2010) and especially Fischbacher et al. (2015), in our experiment for time preferences each participant was presented a choice table with 12 decision situations and asked to make a decision in every row. In each row the respondents had to decide to receive 80 Euros in one month or a higher amount in seven month (beginning with the same amount of 80 Euros in the first choice).[8] The choice table in the survey can be found in Table 2. The higher the amount at which a respondent switches to the payment in seven months, the higher her discount rate and thus her impatience. As in Fischbacher et al. (2015), we construct the variable "patience", which is the minimum discount factor calculated as the ratio between 80 Euro and the value at which the respondent chooses the amount in seven months for the first time. Table 3 reports the distribution of the discount factors (varying between 0.741 and 1) across all 3705 participants and reveals similar results as in Fischbacher et al. (2015), even when the frequency of very impatient respondents who always prefer the amount of 80 Euros in one month is higher in our sample.

Also in line with Fischbacher et al. (2015), our experiment for social preferences is based on a standard dictator game, where generosity is costly. We informed the participants that they can divide the amount of 100 Euro with another randomly selected respondent in the case that they belong to the winner in the lottery. Each participant was presented a table and asked to make a decision for the distribution of the 100 Euro between him and another selected person. The corresponding choice table in the survey can be found in Table 4. We assume higher social or fairness preferences (i.e. a higher generosity) for higher shares of amounts that are allocated to another participant. Table 5 reports the distribution of the Euro amounts which are allocated to other respondents across all 3705 participants. The table shows that only very few participants allocate higher amounts to other persons, whereas more than a half allocates lower amounts and about one sixth of

[8] In their incentivized experiment, Schleich et al. (2018) used a choice table with seven decision situations, whereby the respondents had to decide to receive a payment in six months and one week or in 12 months.

the participants even allocate zero Euros to other persons indicating very low social or fairness preferences. Similar to Fischbacher et al. (2015), however, the majority choose an equal distribution of the 100 Euro, even when the frequency for this group is lower in our sample. In the econometric analysis, we consider the variable "social preferences" which is the amount that is allocated to another person divided by 100 and which thus varies between 0 and 1. Table 1 additionally reports the means and standard deviations of "patience" and "social preferences" in both samples.

Our variable for risk preferences is based on a survey question from the German Socio-Economic Panel (SOEP) that has been experimentally validated and shown to be a reliable indicator for the willingness to take risks in Dohmen et al. (2011) (see also the discussion in Charness et al., 2013) and already applied in several previous studies (e.g. Jaeger et al., 2010, Dohmen et al., 2012, Fischbacher et al., 2015). The participants were therefore asked how willing they generally are to take risks on a five-stage scale (instead of an eleven-stage scale in the SOEP) with the response categories "not at all willing to take risks", "rather not willing to take risks", "undecided", "rather willing to take risks", and "very willing to take risks". On the basis of this ordinal variable, we construct the dummy variable "risk-taking preferences" that takes the value one if the respondent indicated one of the latter two categories. Table 1 reveals that about 28% of the participants in both samples self-assess as rather or very willing to take risks.

Our final behavioral factor refers to trust attitudes. The variable is also based on experimentally validated survey questions from the SOEP, which are similar to common measures of trust in other surveys such as the General Social Survey (GSS) or the World Value Surveys (WVS) (e.g. Fehr, 2009) and that are used in Dohmen et al. (2012). We therefore consider the three following statements: "In general, one can trust people", "nowadays one cannot rely on anyone", and "when dealing with strangers, it is better to be careful before you trust them". The respondents were asked how strongly they agree with these statements on a symmetric scale with five ordered response categories, i.e. "totally disagree", "rather disagree", "undecided", "rather agree", and "totally agree", for which we assign increasing integers from one to five for the first item and decreasing integers from five to one for the two latter items. On this basis, we construct the variable "trust", which is an index that adds the values across the three single indicators. As a consequence, the trust index varies between three and 15. Table 1 shows that the mean of "trust" is slightly higher than eight and reveals very similar means in both samples

3.3. Individual values and norms as well as control variables

Our indicator for environmental values is based on the New Ecological Paradigm (NEP) scale according to Dunlap et al. (2000). The NEP scale is a standard instrument in the social and behavioral sciences and is increasingly common in the economic literature (e.g. Kotchen and Reiling, 2000, Kotchen and Moore, 2007, Attari et al., 2009, Delmas and Lessem, 2014, Fischbacher et al., 2015, Schwirplies and Ziegler, 2016, Ziegler, 2017). In line with Whitmarsh (2011), our indicator is based on the following six statements: "Humans have the right to modify the natural environment to suit their needs", "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", and "the balance of nature is very delicate and easily upset". The respondents were asked how strongly they agree with these statements including five ordered response categories, i.e. "totally disagree", "rather disagree", "undecided", "rather agree", and "totally agree", for which we assign increasing integers from one to five for the three environmentally positively worded statements and decreasing integers from five to one for the three environmentally negatively worded statements. The variable "NEP" is designed by adding up the values of the six items and thus varies between six and 30.

In contrast to most previous studies, but in line with Ziegler (2017), we do not consider a simple one-dimensional indicator for a right-wing or a left-wing identification since it is possible that political orientations are interrelated. In Germany, for example, a conservative identification is often combined with a liberal identification. The participants were therefore asked how strongly they agree with the statements "I identify myself with conservatively oriented policy", "I identify myself with liberally oriented policy", "I identify myself with socially oriented policy", and "I identify myself with ecologically oriented policy", again on a symmetric scale with the five ordered response categories "totally disagree", "rather disagree", "undecided", "rather agree", and "totally agree". On the basis of these ordinal variables, we construct the four dummy variables "conservative identification", "liberal identification", "social identification", and "ecological identification" that take the value one if the respondent indicated one of the latter two categories, respectively. With respect to religious affiliation, the respondents were asked whether they belong to the Roman Catholic Church, to Protestant Churches, to Islam, to other religious communities, or whether they have no religious affiliation. In order to avoid

confounding effects by several religious affiliations, we construct the dummy variable "no religious affiliation" that takes the value one if a respondent currently does not belong to any religious group.

Our first group of control variables refers to housing and household specific factors. Since it can be expected that electricity contract changes are often caused by relocations, we consider the dummy variable "relocation" that takes the value one if the respondent changed her primary residence within the last ten years. The dummy variable "household housing ownership" takes the value one if the respondent currently lives in an own house or apartment and thus is not a tenant. Furthermore, we consider the dummy variable "higher household income" that takes the value one if the respondent indicated a household income class with incomes that are higher than 2500 Euros. In addition, the variable "household electricity costs" indicates the annual costs in Euro divided by 1000. With respect to common socio-demographic variables, the variable "age" is the age of the respondent in years, the dummy variable "female" takes the value one if the respondent is a woman, the dummy variable "high education" takes the value one if the highest level of education is at least a university degree, and the dummy variable "Eastern Germany" takes the value one if the participant currently lives in one of the new Eastern federal states including Berlin.

The lower part of Table 1 reports some descriptive statistics for the individual values and norms as well as the control variables. Overall, it reveals very similar means and standard deviations across the two samples. Specifically, the table reveals quite strong environmental values on average. Furthermore, it shows high ecological and social policy orientations, whereas the identification with conservative policy is rather low on average. The statistics for "no religious affiliation", "age", "female", and "Eastern Germany" are completely in line with the values in the population of Germany by definition since our sample was stratified according to these four criteria.

4. Estimation results

4.1. Binary probit model analysis

Table 6 reports the Maximum Likelihood (ML) estimation results for three different binary probit model specifications with respect to general changes to alternative electricity

contracts.[9] In line with the results of He and Reiner (2017) for Great Britain, we first consider model specifications that only include our behavioral factors or only the four behavioral factors plus our six variables for individual values and norms. The corresponding estimation results can be found in the first two columns of Table 6. While the first column reveals significantly positive effects of patience, trust, and (in line with Schleich et al., 2018, for eight European countries) risk-taking preferences, which apparently confirms our first three hypotheses, the significance of the effects of the latter two variables becomes weaker if the individual values and norms are included as further explanatory variables. According to the second column, not only a left-wing orientation (i.e. social or ecological policy identifications), but also a conservative policy identification is significantly positively correlated with the change to alternative electricity contracts. Furthermore, citizens with no religious affiliation significantly more often and citizens with strong environmental values significantly less often change the electricity contracts.

However, the third column of Table 6 reveals that many of these effects of behavioral factors and individual values and norms are only spurious and become insignificant when the control variables are included. As a consequence, only more patient citizens and citizens with social or ecological policy identifications significantly more often switch their electricity contracts. While the former result is partly in line with Schleich et al. (2018), the latter result is in line with He and Reiner (2017), who also report a positive correlation with a left-wing orientation. According to the former result, Hypothesis 1 can be strongly confirmed for the case of the general change of electricity contracts, whereas Hypothesis 2 and Hypothesis 3 cannot be confirmed for this case.[10] With respect to the control variables, most of them are significantly correlated with switching the electricity contracts, which is in line with Schleich et al. (2018), but in contrast to He and Reiner (2017). As expected, relocations in the past have significantly positive effects on electricity contract changes. But also the housing ownership and a high household income have significantly positive effects, whereas household electricity costs have a

[9] All estimations (and also all descriptive statistics as discussed above) were conducted with the statistical software package Stata. We consider robust estimates of the standard deviations of the estimated parameters and thus robust z-statistics. The robustness follows from the quasi maximum likelihood theory and refers to several types of misspecifications on the basis of the ML estimations.

[10] The missing confirmation of Hypothesis 2 is in contrast to the results of Schleich et al. (2018), who report a significantly positive correlation between risk-taking preferences and the change of electricity contracts.

weakly significantly negative effect. Furthermore, older citizens, males, and citizens from Eastern Germany significantly more often switch their electricity contracts.

The fourth column of Table 6 reports the estimated average marginal and discrete probability effects and reveals that the strength of the estimated effects of patience, but also of social and ecological policy identifications is moderate. For example, an increase of the discount factor by 0.1 (which e.g. corresponds to an increase from the lowest value to the fourth-lowest value) leads to an approximately estimated average increase of the probability for switching the electricity contracts by about 2.6 percentage points. An increase of the discount factor from the lowest value (i.e. 0.741) to the highest value (i.e. 1) leads to an estimated average increase of the probability by about 6.7 percentage points, which corresponds to an increase of the probability by about 11.3%. In comparison, the estimated average discrete effects of several control variables like the housing ownership or the place of residence are stronger. For example, for male housing owners from Eastern Germany who have a higher household income and who changed the primary residence within the last ten years, the estimated average probability for electricity contract changes is almost 27.9 percentage points and thus about 55.6% higher than for the comparison group.

Table 7 reports ML estimation results for binary probit models with respect to the specific change to green electricity contracts. While the left part of the table refers to the inclusion of the maximum number of 3639 respondents, where different assumptions about the green or non-green statuses of their current electricity contracts are made, the right part refers to the results on the basis of the more reliable electricity contract data. For the dataset with all 3639 respondents, we again compare the estimation results in two restricted model specifications (see the first and second columns) with the results in a full model specification that includes all control variables besides the four behavioral factors and the six variables for individual values and norms (see the third column). Now, the additional inclusion of control variables does not qualitatively change the estimation results for the behavioral factors and the individual values and norms in the restricted model specifications. With respect to the control variables, the third column of the left part of the table and the corresponding first column of the right part of the table reveal that only household income has a robust significantly positive effect on switching to green electricity contracts on the basis of both datasets.

With respect to the behavioral factors, the left part of Table 7 shows a significantly positive effect of social preferences, which suggests to confirm Hypothesis 4. However, this confirmation is not very robust since this effect becomes insignificant on the basis of the more reliable electricity contract data, which might be influenced by the smaller number of observations in this case. Instead, Hypothesis 1 and Hypothesis 3 can be clearly confirmed for the case of switching to green electricity contracts due to the robust significantly positive effects of patience and especially trust on the basis of both datasets. In contrast, Hypothesis 2 cannot be confirmed in this case, i.e. risk-taking preferences are not only insignificantly correlated with the general change to alternative electricity contracts (see Table 6), but also with the specific change to green electricity contracts. In addition, Hypothesis 5, Hypothesis 7a, and Hypothesis 7b, cannot be confirmed, either, due to the insignificant effects of environmental values and religious affiliation. In contrast, political identification is the main factor among our indicators for individual values and norms since an ecological policy orientation is robustly significantly positively correlated with the change to green electricity contracts on the basis of both datasets. This strongly confirms Hypothesis 6. The result is strengthened by the robust significantly negative effect of a liberal policy identification, which rather belongs to a right-wing orientation in Germany.

The corresponding estimated average marginal and discrete probability effects are reported in the fourth column of the left part and the second column of the right part of Table 7, respectively. The results reveal that the strength of the estimated average discrete probability effects of patience is a bit lower than the already moderate strength in the case of the general change of electricity contracts (see Table 6). In contrast, the strength of the estimated effect of trust is higher since an increase of the trust index by one point leads to an approximately estimated average increase of the probability for switching to green electricity contracts by about 0.8 to 0.9 percentage points. An increase of the trust index from the minimum value (i.e. 3) to the maximum value (i.e. 15) even leads to an estimated average increase of the probability by about ten to eleven percentage points. With respect to political identification, especially the estimated effect of an ecological policy orientation is very strong. For citizens with this strong policy orientation, the estimated average probability for switches to green electricity contracts is about nine percentage points higher than for citizens with a weak ecological policy orientation. As already discussed above, this factor is especially more relevant than environmental

values, which, in contrast to many previous studies of other climate and more general pro-environmental activities, are surprisingly not significantly correlated with the change to green electricity contracts.[11]

In order to test the robustness of our estimation results in all binary probit models, we have examined alternative approaches in several directions. Besides some alternative model specifications with different explanatory variables, we have, for example, considered two further indicators for time preferences. One indicator refers to the number of choices for the amounts in seven months across the 12 decision situations (e.g. Fischbacher et al., 2015). Another alternative indicator excludes those respondents with non-monotone decisions, i.e. who switched more than once between the payments in one and seven months (e.g. Dohmen et al., 2010). Due to the underlying ordinal variables for our single trust and environmental values items, we have also constructed corresponding dummy variables for high trust and strong environmental values and then added up the values of the dummy variables, respectively. As a consequence, the alternative trust index varies between zero and three and the alternative NEP indicator varies between zero and six in this case. However, the corresponding estimation results are qualitatively very similar as in Table 6 and Table 7, whereby the effect of patience is partly slightly strengthened and the effect of trust is partly slightly weakened on the basis of these alternative indicators.[12]

However, it should be noted that the base category in the binary probit model for the change to green electricity contracts is heterogeneous. It comprises respondents who switched to non-green electricity contracts, respondents who did not switch at all and currently have non-green electricity contracts, and respondents who did not switch at all and currently have green electricity contracts. Since the derivation of our hypotheses for the change to green electricity contracts refers to the literature on preferences for renewable energies, we have additionally considered binary probit models for currently having green electricity contracts[13] by including the same explanatory variables as before. A

[11] However, on the basis of the first dataset, the effect of environmental values is significant if the variable for ecological policy identification is excluded, which is obviously due to the high correlation between the two variables. The corresponding estimation results are not reported due to brevity, but are available upon request.

[12] The estimation results are again not reported due to brevity, but are available upon request.

[13] This means that the switching behavior has no relevance for this dependent dummy variable that takes the value zero if the respondent currently has no green electricity contract.

comparison of the corresponding estimation results[14] with the previous results reveals strong similarities with a few exceptions. For example, the positive effect of household income becomes insignificant in the new binary probit model and the estimated negative effect of a liberal policy orientation is weakened on the basis of the first data set with the maximum number of 3620 respondents, for whom usable indications of the electricity supplier and tariff are available, as discussed above. With respect to the behavioral factors, the estimated positive effect of social preferences is strengthened, which is in line with the confirmation of Hypothesis 4, whereas the estimated positive effect of patience is weakened. In contrast, the dominant significantly positive effect of an ecological policy orientation remains stable, which is strongly in line with the confirmation of Hypothesis 6.

4.2. Multinomial logit model analysis

However, not only the two categories of the dependent dummy variable "change to green electricity contracts", but also the categories of "changes of electricity contracts" are heterogeneous. The latter dependent variable takes the value one if a respondent changed the electricity contract within the last ten years so that this category comprises respondents who switched to current green electricity contracts and respondents who switched to current non-green electricity contracts. In order to better disentangle the possibly different determinants of the general change to alternative electricity contracts and the specific change to green electricity contracts, we therefore now disaggregate the categories of the previous dependent dummy variable, i.e. we consider the three categories "change to green electricity contracts", "change to non-green electricity contracts" (excluding changes to current green electricity contracts), and "no change of electricity contracts". Table 8 shows the frequencies for these three mutually exclusive categories on the basis of the two datasets with the inclusion of the maximum number of 3639 respondents and with the more reliable electricity contract data, which is in line with the binary probit model analysis of switches to green electricity contracts. Due to the inclusion of three mutually exclusive categories, multinomial discrete choice models must be considered in this case.

[14] These estimation results are again not reported due to brevity, but are available upon request.

Table 9 reports the corresponding ML estimation results for multinomial logit models that are based on our preferred full specification with all behavioral factors and individual values and norms as well as control variables. The base category refers to respondents that did not switch their electricity contracts at all within the last ten years, i.e. neither switched to green electricity contracts, nor to non-green electricity contracts. The estimation results for time and risk preferences as well as trust are in line with the results in Table 6 and Table 7 on the basis of both datasets, i.e. patience has a significantly positive effect on changes to both green and non-green electricity contracts, trust has only a significantly positive effect on changes to green electricity contracts, and risk-taking preferences have no significant effects on any electricity contract changes, compared to not switching the electricity contracts at all, respectively. Interestingly, social preferences are significantly negatively correlated with changes to non-green electricity contracts, whereas the corresponding correlation with switches to green electricity contracts is insignificant. Due to the estimated positive parameter in the latter case, social preferences have therefore specific significantly positive effects on changes to green compared to non-green electricity contracts.[15] This result reveals why in the binary probit models analysis with heterogeneous categories, social preferences are not significantly correlated with changes to green electricity contracts, at least on the basis of the second dataset (see Table 7).

In line with Table 6 and Table 7, Table 9 also reveals a significantly negative correlation between a social policy orientation and the change to non-green electricity contracts as well as a significantly negative correlation between a liberal policy orientation and a significantly positive correlation between an ecological policy orientation and the change to green electricity contracts, respectively. Interestingly, the effects of a liberal and an ecological policy orientation are not only significant compared to not switching the electricity contracts at all, but also compared to changes to non-green electricity contracts.[16] In contrast, environmental values and religious affiliation have still no robust significant effects. With respect to our control variables, the estimation results for the change to non-green electricity contracts are strongly in line with the results in Table 6, i.e. most of

[15] This interpretation is strongly confirmed in a multinomial logit model where the base category refers to respondents that changed to non-green electricity contracts. In this case, the social preferences parameter for the change to green electricity contracts is strongly significantly different from zero. The estimation results are again not reported due to brevity, but are available upon request.

[16] This result is again confirmed in the multinomial logit model with the alternative base category as aforementioned.

them have significantly positive effects. However, in contrast to the estimation results in Table 7, more control variables also have significant effects on the specific change to green electricity contracts, which could not be identified in the binary probit model analysis due to the heterogeneous categories in these approaches. Therefore, relocation decisions, housing ownership, household income, and low household electricity costs have significantly positive effects on switches to both green and non-green electricity contracts.

Finally, it might be argued that the base category in our three-alternative logit models is still rather heterogeneous since it refers to respondents that did indeed not switch their electricity contracts within the last ten years, but can currently have green or non-green electricity contracts. Therefore, we have additionally considered four-alternative logit models which disaggregate the previous base category by considering respondents that currently have green electricity contracts and respondents that currently have non-green electricity contracts. However, the corresponding estimation results in these four-alternative logit models provide no robust new explanation patterns for our explanatory variables of interest, i.e. for the behavioral factors and for the individual values and norms, especially with respect to the disaggregation of the two categories, as aforementioned.[17]

5. Conclusions

Based on data from a large-scale survey among more than 3700 German citizens, this paper empirically disentangles how heterogeneity in individual preferences affects the general change of electricity contracts and the specific change to green electricity contracts. In fact, our econometric analysis with binary probit and multinomial logit models reveals a strong relevance of behavioral factors and individual values and norms. For example, lower discount rates and thus a higher patience have a significantly positive effect on both general switches to alternative electricity contracts and specific switches to green electricity contracts. For the specific change to green electricity contracts, two further behavioral factors, i.e. social preferences and especially trust, are also relevant. Our estimation results also imply an important role of political identification, i.e. citizens with a left-wing orientation significantly more often switch their electricity contracts,

[17] The estimation results are again not reported due to brevity, but are available upon request.

while a liberal policy orientation has a significantly negative and an ecological policy orientation has a strong significantly positive effect on the change to green electricity contracts. Furthermore, several household specific factors like relocation decisions or housing ownership as well as socio-demographic and socio-economic variables like household income are also relevant.

Our study therefore provides a better understanding of the decision to switch electricity contracts in Germany. The empirical analysis especially provides new explanation patterns for the phenomenon that only relatively few households regularly change their electricity contracts and specifically switch to green electricity contracts, although they have high stated preferences for such changes. For example, the results for time preferences suggest that rather impatient citizens perceive the costs for finding and evaluating the large number of different electricity suppliers and tariffs as too high so that their willingness to change their electricity contracts is restricted. Our estimation results also suggest that trust in the supplier and the quality of the product are important in the case of green electricity and that citizens with higher social or fairness preferences draw a higher utility from their contribution to this specific public good, i.e. that they have a higher propensity to internalize the corresponding externalities. Furthermore, our empirical analysis reveals that environmental values only play a minor role for the choice of green electricity contracts compared to an ecological policy identification, which is clearly a much more dominating factor.

Since a high individual willingness to change electricity contracts is a main condition for well-functioning electricity markets and a high extent to switch to green electricity contracts is an important contribution to a public good, competition and environmental policy is generally interested in high switching rates. Our empirical results therefore suggest several directions for policy, but also for electricity suppliers, to increase these switching rates. For example, the relevance of patience for changing contracts suggests the further reduction of switching costs such as search and transaction costs. Furthermore, the high importance of trust for the change to green electricity contracts suggests transparency initiatives of completely green electricity suppliers, but also conventional electricity suppliers, in order to decrease concerns against renewable energies and especially to decrease skepticisms that the electricity is really generated from renewable energy sources. In addition, our significant effects of several socio-demographic and socio-economic

variables and especially household specific factors suggest targeted marketing efforts for specific population groups.

Methodologically, our empirical study is based on data from the combination of a common survey and two incentivized artefactual field experiments to identify time and social preferences. Therefore, our paper contributes to previous studies that transfer laboratory experiments to the field. One limitation of our study is the possibility of imprecise information about the current electricity contracts and the switching behavior by the respondents. Administrative data of customers from electricity suppliers would certainly be helpful in this respect. Two first studies in this direction can be found in Hortaçsu et al. (2017), who use electricity meter data in Texas (USA), and Vesterberg (2018), who uses electricity contract choice (panel) data from one Swedish supplier. Both studies examine some rather specific topics, i.e. while the former study considers the relevance of search frictions and brand advantages of the incumbent electricity supplier for the low willingness to switch to alternative (lower priced) electricity suppliers, the latter panel data analysis considers the relevance of state dependence for the choice between two specific electricity contracts (i.e. fixed-price versus variable-price contracts). In particular, none of these two studies includes explanatory variables at the individual level, especially with respect to behavioral factors and individual values and norms.

Econometric analyses with administrative data in this direction, preferably on the basis of panel data to control for unobserved heterogeneity, are therefore an interesting direction for future research if the necessary data were available. The cooperation with an electricity supplier would also be an excellent basis for natural field experiments in order to analyze more specifically several instruments that increase electricity contract changes and especially switches to green electricity contracts.

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Tables

Table 1: Descriptive statistics of dependent and explanatory variables in the econometric analysis

	Full sample			Estimation sample with reliable electricity contract data		
Variables	Number of observations	Mean	Standard deviation	Number of observations	Mean	Standard deviation
Change of electricity contracts	3705	0.625	0.48	--	--	--
Change to green electricity contracts	3639	0.228	0.42	2689	0.191	0.39
Green electricity contracts	3620	0.293	0.46	1974	0.322	0.47
Patience	3705	0.864	0.10	2689	0.863	0.10
Social preferences	3705	0.341	0.20	2689	0.339	0.21
Risk-taking preferences	3705	0.285	0.45	2689	0.277	0.45
Trust	3705	8.159	2.23	2689	8.163	2.25
NEP	3705	24.182	3.77	2689	24.219	3.75
Conservative identification	3705	0.224	0.42	2689	0.225	0.42
Liberal identification	3705	0.338	0.47	2689	0.345	0.48
Social identification	3705	0.637	0.48	2689	0.634	0.48
Ecological identification	3705	0.489	0.50	2689	0.482	0.50
No religious affiliation	3705	0.349	0.48	2689	0.348	0.48
Relocation	3705	0.543	0.50	2689	0.541	0.50
Household housing ownership	3705	0.421	0.49	2689	0.408	0.49
Higher household income	3705	0.461	0.50	2689	0.449	0.50
Household electricity costs	3705	0.796	0.41	2689	0.782	0.41
Age	3705	48.720	15.10	2689	48.377	15.20
Female	3705	0.505	0.50	2689	0.505	0.50
Higher education	3705	0.198	0.40	2689	0.196	0.40
Eastern Germany	3705	0.209	0.41	2689	0.208	0.41

Table 2: Choice table in the time preferences experiment

Choice situation	Option A (payment amount in one month)	Option B (payment amount in seven months)
1	80 Euro □	80 Euro □
2	80 Euro □	80,50 Euro □
3	80 Euro □	81 Euro □
4	80 Euro □	82 Euro □
5	80 Euro □	83,50 Euro □
6	80 Euro □	85,50 Euro □
7	80 Euro □	88 Euro □
8	80 Euro □	91 Euro □
9	80 Euro □	94,50 Euro □
10	80 Euro □	98,50 Euro □
11	80 Euro □	103 Euro □
12	80 Euro □	108 Euro □

Table 3: Frequencies of minimum discount factors in the time preferences experiment

Discount factors	0.741	0.777	0.812	0.847	0.879	0.909	
Frequencies	1046 (28.23%)	209 (5.64%)	177 (4.78%)	203 (5.48%)	412 (11.12%)	436 (11.77%)	
Discount factors	0.936	0.958	0.976	0.988	0.994	1	Total
Frequencies	296 (7.99%)	164 (4.43%)	102 (2.75%)	80 (2.16%)	275 (7.42%)	305 (8.23%)	3705 (100%)

Table 4: Choice table in the social preferences experiment (i.e. dictator game)

Amount for you	0 Euro	10 Euro	20 Euro	30 Euro	40 Euro	50 Euro	60 Euro	70 Euro	80 Euro	90 Euro	100 Euro
Amount for another randomly selected person	100 Euro	90 Euro	80 Euro	70 Euro	60 Euro	50 Euro	40 Euro	30 Euro	20 Euro	10 Euro	0 Euro
Decision	□	□	□	□	□	□	□	□	□	□	□

Table 5: Frequencies of payment amounts (in Euro) for other participants in the social preferences experiment (i.e. dictator game)

Payments	0	10	20	30	40	50
Frequencies	626 (16.90%)	208 (5.61%)	336 (9.07%)	396 (10.69%)	378 (10.20%)	1670 (45.07%)
Payments	60	70	80	90	100	Total
Frequencies	24 (0.65%)	16 (0.43%)	21 (0.57%)	15 (0.40%)	15 (0.40%)	3705 (100%)

Table 6: Estimation results in binary probit models, dependent variable: change of electricity contracts

Explanatory variables	Maximum Likelihood estimates (robust z-statistics)			Estimates of average marginal and discrete effects
Patience	0.782*** (3.58)	0.786*** (3.59)	0.706*** (3.15)	0.261***
Social preferences	-0.096 (-0.93)	-0.087 (-0.83)	-0.107 (-1.01)	n.s.
Risk-taking preferences	0.104** (2.22)	0.089* (1.88)	0.062 (1.30)	n.s.
Trust	0.025*** (2.67)	0.019* (1.87)	0.012 (1.23)	n.s.
NEP	--	-0.014** (-2.28)	-0.009 (-1.45)	n.s.
Conservative identification	--	0.104** (1.97)	0.044 (0.83)	n.s.
Liberal identification	--	-0.030 (-0.64)	-0.045 (-0.95)	n.s.
Social identification	--	0.116** (2.37)	0.097* (1.94)	0.036*
Ecological identification	--	0.120** (2.44)	0.110** (2.22)	0.041**
No religious affiliation	--	0.139*** (3.09)	0.073 (1.50)	n.s.
Relocation	--	--	0.174*** (3.61)	0.064***
Household housing ownership	--	--	0.180*** (3.64)	0.066***
Higher household income	--	--	0.154*** (3.24)	0.057***
Household electricity costs	--	--	-0.109* (-1.88)	-0.040*
Age	--	--	0.004*** (2.79)	0.002***
Female	--	--	-0.107** (-2.40)	-0.040**
Higher education	--	--	0.029 (0.50)	n.s.
Eastern Germany	--	--	0.170*** (2.94)	0.062***
Constant	-0.562*** (-2.76)	-0.371 (-1.45)	-0.648** (-2.30)	--
Number of observations	3705			

Notes: * (**, ***) means that the appropriate parameter or effect is different from zero at the 10% (5%, 1%) significance level, respectively; n.s. means that the appropriate effect is not significant

Table 7: Estimation results in binary probit models, dependent variable: change to green electricity contracts

Explanatory variables	Data with different assumptions for electricity contracts				Reliable electricity contract data	
	Maximum Likelihood estimates (robust z-statistics)			Estimates of average marginal and discrete effects	Maximum Likelihood estimates (robust z-statistics)	Estimates of average marginal and discrete effects
Patience	0.460* (1.94)	0.449* (1.88)	0.423* (1.75)	0.125*	0.646** (2.22)	0.171**
Social preferences	0.259** (2.29)	0.230** (2.00)	0.227** (1.96)	0.067**	0.195 (1.41)	n.s.
Risk-taking preferences	-0.003 (-0.06)	-0.023 (-0.45)	-0.030 (-0.57)	n.s.	-0.008 (-0.12)	n.s.
Trust	0.036*** (3.43)	0.030*** (2.79)	0.028** (2.52)	0.008**	0.034** (2.52)	0.009**
NEP	--	0.005 (0.77)	0.006 (0.90)	n.s.	0.001 (0.11)	n.s.
Conservative identification	--	0.019 (0.33)	-0.009 (-0.15)	n.s.	-0.002 (-0.02)	n.s.
Liberal identification	--	-0.107** (-2.07)	-0.123** (-2.37)	-0.036**	-0.124* (-1.95)	-0.032**
Social identification	--	0.050 (0.89)	0.043 (0.77)	n.s.	0.002 (0.02)	n.s.
Ecological identification	--	0.295*** (5.42)	0.291*** (5.30)	0.087***	0.341*** (5.02)	0.091***
No religious affiliation	--	0.070 (1.43)	0.073 (1.36)	n.s.	0.078 (1.20)	n.s.
Relocation	--	--	0.056 (1.08)	n.s.	0.040 (0.64)	n.s.
Household housing ownership	--	--	0.056 (1.03)	n.s.	0.047 (0.72)	n.s.
Higher household income	--	--	0.091* (1.75)	0.027*	0.127** (2.01)	0.034**
Household electricity costs	--	--	-0.076 (-1.19)	n.s.	-0.137* (-1.75)	-0.036*
Age	--	--	0.003 (1.54)	n.s.	0.001 (0.51)	n.s.
Female	--	--	-0.028 (-0.56)	n.s.	-0.075 (-1.26)	n.s.
Higher education	--	--	0.010 (0.16)	n.s.	0.040 (0.55)	n.s.
Eastern Germany	--	--	-0.032 (-0.50)	n.s.	0.100 (1.33)	n.s.
Constant	-1.527*** (-6.83)	-1.758*** (-6.19)	-1.868*** (-6.05)	--	-2.002*** (-5.49)	--
Number of observations	3639				2689	

Notes: * (**, ***) means that the appropriate parameter or effect is different from zero at the 10% (5%, 1%) significance level, respectively; n.s. means that the appropriate effect is not significant

Table 8: Frequencies for the three categories in the multinomial logit models

Categories	Data with different assumptions for electricity contracts	Reliable electricity contract data
Change to green electricity contracts	830 (22.81%)	514 (19.11%)
Change to non-green electricity contracts	1418 (38.97%)	784 (29.16%)
No change of electricity contracts	1391 (38.22%)	1391 (51.73%)
Total	3639 (100%)	2689 (100%)

Table 9: Maximum likelihood estimates (robust z-statistics) in multinomial logit models, base category: no change of electricity contracts

	Data with different assumptions for electricity contracts		Reliable electricity contract data	
	Change to green electricity contracts	Change to non-green electricity contracts	Change to green electricity contracts	Change to non-green electricity contracts
Patience	1.300*** (2.78)	1.099*** (2.70)	1.455*** (2.68)	0.886* (1.84)
Social preferences	0.175 (0.78)	-0.395** (-2.05)	0.116 (0.45)	-0.578** (-2.55)
Risk-taking preferences	0.015 (0.15)	0.129 (1.49)	0.016 (0.14)	0.087 (0.85)
Trust	0.050** (2.35)	0.007 (0.38)	0.065** (2.56)	0.016 (0.77)
NEP	0.001 (0.06)	-0.019* (-1.75)	-0.003 (-0.19)	-0.009 (-0.70)
Conservative identification	0.031 (0.27)	0.093 (0.97)	0.050 (0.37)	0.163 (1.44)
Liberal identification	-0.204** (-2.04)	0.010 (0.12)	-0.177 (-1.50)	0.095 (0.93)
Social identification	0.156 (1.44)	0.158* (1.76)	0.099 (0.77)	0.265** (2.46)
Ecological identification	0.498*** (4.74)	-0.003 (-0.04)	0.562*** (4.41)	-0.100 (-0.91)
No religious affiliation	0.168 (1.63)	0.088 (0.99)	0.175 (1.45)	0.108 (1.02)
Relocation	0.258** (2.56)	0.308*** (3.53)	0.194* (1.65)	0.310*** (3.01)
Household housing ownership	0.253** (2.42)	0.323*** (3.62)	0.229* (1.86)	0.401*** (3.72)
Higher household income	0.281*** (2.80)	0.240*** (2.80)	0.325*** (2.77)	0.274*** (2.68)
Household electricity costs	-0.226* (-1.83)	-0.195* (-1.87)	-0.388*** (-2.66)	-0.407*** (-3.19)
Age	0.008** (2.45)	0.007** (2.41)	0.004 (1.07)	0.006* (1.74)
Female	-0.153 (-1.62)	-0.203** (-2.53)	-0.245** (-2.19)	-0.306*** (-3.18)
Higher education	0.048 (0.40)	0.054 (0.53)	0.078 (0.57)	0.025 (0.21)
Eastern Germany	0.131 (1.07)	0.345*** (3.31)	0.317** (2.26)	0.360*** (2.89)
Constant	-3.027*** (-5.03)	-1.147** (-2.26)	-3.329*** (-4.88)	-1.662*** (-2.81)
Number of observations	3639		2689	

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