# Are Consumers Willing to Pay More for Electricity from Cooperatives? Results from an Online Choice Experiment in Germany

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**Abstract**

With liberalization in 1998, numerous firms have entered the German retail electricity market, including newly formed cooperatives. Based on Transaction Cost Economics, we develop a theoretical framework seeking to explain preferences for electricity supplied by cooperatives from a consumer perspective. Drawing on a convenience sample of 287 German electricity consumers and Choice Experiment data from an online survey, we estimate Willingness-to-Pay values for organizational attributes of electricity suppliers, while accounting for observed and unobserved heterogeneity. Consumers in the sample exhibit a large Willingness-to-Pay for renewable energy. Our results also indicate a substantial Willingness-to-Pay for transparent pricing, participation in decision making, and local suppliers. Democratic decision making – a distinct feature of cooperatives – exhibits positive Willingness-to-Pay values for approximately one fifth of the sample. Taken together, our findings suggest a slightly higher Willingness-to-Pay for electricity produced by cooperatives. Limitations of applied sampling and other important aspects of energy transition are also discussed.

**Keywords:** Choice Experiments; Cooperatives; Energy Transition

**JEL Codes:** C25; D12; Q41

## 1 Introduction

Over the past 15 years, German electricity supply has undergone significant changes, and a large number of new firms have entered the retail market (Bundesnetzagentur 2012; Jansen 2012; Bontrup and Marquardt 2010), including cooperatives that are generally distinguished from publicly-owned or investor-owned firms (IOF). Consequently, today numerous German electricity suppliers not only differ in terms of prices, offered services, or energy mix, but also regarding how they are organized (i.e. their governance structures).

Empirical research on energy cooperatives in Germany has largely focused on practitioner problems and the production side (Flieger and Klemisch 2008; Menke 2009; Klemisch and Maron 2010; Holstenkamp and Ulbrich 2010; Degenhart 2010; Müller and Rommel 2011; Müller and Holstenkamp 2012, Holstenkamp and Müller 2013), but rarely on the role of consumers. Theory-wise, a consumer perspective on the organization of enterprise can be built on Williamson's (1985) argument that opportunistic and boundedly rational agents may require safeguards for organizing transactions. Controlling for other important characteristics of electricity (e.g. renewable energy share), we developed a Choice Experiment (CE) to estimate consumer preferences and subsequent Willingness-to-Pay (WTP) values for governance attributes of electric utilities. In a CE, respondents take part in a survey and repeatedly choose between two or more alternatives describing the good to be valued, separated into its characteristics, generating data that can be used to estimate welfare measures for changes in attributes.

We included several governance attributes in our CE, such as decision-making structures and commitment to price transparency, which may help consumers to reduce transaction costs resulting from challenges present on electricity markets, such as monopolistic structures in generation and transmission or information asymmetries. Our study focuses on Cooperative Governance as a means to economize on transaction costs (Hansmann 1996; Müller and Rommel 2011), seeking to understand the recent success of electricity-supply cooperatives from the consumer side of the transaction, especially in markets for renewable energy. Our study is explorative in nature, as the topic has not been researched so far. Hence, we relied on a small non-probability sample from students and employees at different universities to assure environmental awareness and high education standards.

This paper is organized as follows. First, we develop a theoretical framework for analyzing Cooperative Governance in retail electricity markets and then describe our empirical approach, followed by presentation and discussion of results. The last section offers a summary and concludes. Background and Theoretical Framework

## 2 Energy Transition and Cooperatives

The liberalization of electricity markets in 1998, in combination with the *Erneuerbare Energien Gesetz* (Renewable Energy Act) and the start of nuclear phase-out in 2002, set the framework for a process which is referred to as an *Energiewende* (energy transition) among the German public.[1] Some of its most visible outcomes have been technical change (e.g. decentralized renewable-energy power plants), a retail market for renewable energy, and electric utilities competing for ways to promote further development of this energy transition vis-à-vis their customers (Kaenzig et al. 2013).[2] It is, thus, not surprising that much recent research on consumer electricity preferences has focused on WTP for renewable energy (e.g. Roe et al. 2001; Borchers et al. 2007; Scarpa and Willis 2010; Álvarez-Farizo and Hanley 2002; Dimitropoulos and Kontoleon 2009; Meyerhoff et al. 2010; (Michelsen and Madlener 2012)).

Electricity from renewable energy sources has characteristics strongly resembling from credence goods. Consumers cannot, for example, easily ascertain the effect of its consumption on their utility, and electric utilities may use tariffs for renewable energy to hide margins, resulting from information asymmetries and opportunistic behavior (Akerlof 1970; Jensen and Meckling 1976).

Historically, successful cooperatives have been explained by their ability to help members overcome economic misery (Müller 1976; Gros 2009), the social network created among members, most prominently displayed in a cooperative's

[1] A detailed analysis of the legal aspects, such as the Renewable Energy Act, technical change, and its relationship to the recent rise of electricity cooperatives, is beyond the scope of this paper. For more information see Müller and Rommel (2011).

[2] In many Western countries, consumer preferences have changed over the last decades. For a relatively small but growing part of the population, social and environmental impacts of consumption choices play an increasingly important role. A recent overview on this phenomenon can be found in Seyfang (2009).

*Genossenschaftsgeist* (cooperative spirit; Draheim 1955), or their contribution to competitive pricing under imperfect competition (Hanisch et al. forthcoming). One could argue today that increased consumer demand for electricity from cooperatives reflects their self-help character: people support cooperatives because there seems no other way to make nuclear power plants obsolete and achieve a sustainable energy system. Social networks may also explain consumer support, because cooperatives provide space for communication and activities to people with similar attitudes. In contrast to IOFs, whose owners share the goal of maximizing profits, cooperatives, by definition (ICA 2012), seek to advance their members' economic, social, and cultural goals through a jointly owned and democratically controlled organization.

The user-owner identity in cooperatives leads to an alignment of interests, resulting in higher levels of transparency and lower regulation costs. Cooperatives can more easily ensure price transparency, reducing uncertainties related to the credence-good character of renewable energy (Müller and Rommel 2011). In contrast to the approaches mentioned already, these facets are quite explicitly taken into account by the Transaction Cost Economics literature on cooperatives (Bonus 1986; Hansmann 1996; Chaddad and Iliopoulos 2013).

## 2.1 Transaction Cost Economics and Cooperative Governance

Based on the seminal work of Coase (1937), Transaction Cost Economics has argued that economic transactions are associated with costs exceeding production costs. Net utility derived from economic transactions cannot be understood solely by looking at prices, but must also be evaluated against knowledge of how transactions are organized (Coase 1937, 1960; Williamson 1985). Transaction costs are added to those for production and consumption, occurring for example when actors negotiate and design contracts or safeguard transactions. Agents can economize by finding optimal governance systems for organizing transactions (Williamson 1985). Governance can be broadly defined as institutions at contractual or organizational levels which can be shaped by actors involved in transactions (Williamson 1991).

Cooperative governance is distinct from that of publicly owned utilities and IOFs. In spite of the diverse governance models existing within the cooperative sector (Chaddad and Cook 2004; Cornforth 2004; Theurl and Kring 2002), common features can be found across it which are most prominently reflected in cooperative principles (see also Laurinkari 1994; ICA 2012) that form the core of cooperative governance. These principles include (1) voluntary and open membership; (2) democratic control; (3) economic participation; (4) autonomy and independence; (5) education, training, and information; (6) concern for community; and (7) cooperation of cooperatives.

Historically, electricity markets have been dominated by monopolistic structures, dating back to the natural monopoly of the grid and its associated regulation costs (Baumol 1977). In a cooperative, profits and losses are typically distributed proportionately to patronage (economic participation). Thus, relatively high/low prices would result in profits/losses being attributed to user-owners proportionate to the amount of services received, aligning interests of users and owners and lowering regulation costs (Hansmann 1996). Although today integrated monopolists are unbundled and the natural monopoly is confined to the grid, customers are confronted with the market power of former monopolists in electricity generation (Bundesnetzagentur and Bundeskartellamt 2013). By becoming cooperative members, customers can participate in its democratic decision making.

Credence good characteristics of electricity generation result from high information costs. Cooperatives are typically embedded in local economic structures which can reduce information and enforcement costs through peer pressure or higher levels of trust (Granovetter 1985; Bonus 1986). An overview of the challenges observed on electricity markets and their cooperative governance solutions is listed in Table 1.

**Table 1: Challenges and Cooperative Governance Solutions on Electricity Markets**

| **Challenge on Electricity Market** | **Cooperative Governance Solution** | **Key Reference** |
|---|---|---|
| Monopolistic market structures | Participation and democratic control, reducing regulation costs | Hansmann (1996) |
| Energy transition and sustainable consumption | Activity space for commitment/initiatives, reducing information costs | Müller and Rommel (2011) |
| Electricity (from renewables) as a credence good | Transparency; local suppliers embedded in social networks, reducing enforcement and information costs | Bonus (1986) |

Empirically, few studies have tried to quantify WTP for organizational attributes in the environmental valuation literature. Remoundou et al. (2012) analyzed whether WTP for environmental protection depends on the providing authority. Bougherara and Ducos (2006) directly included governance attributes into a CE on contracts between the European Union and farmers. Reise et al. (2012) studied farmers' contracts. In analyzing supply relationships with biogas plants, the authors included contract duration and contracting partner as attributes in a CE. Abebe et al. (2013) study preferences for different contract farming settings of smallholders in Ethopia. Applying a CE, they use the organizational form of the contractor and details of the contract as attributes. Two studies used Stated Preferences methods related to electricity and cooperatives (Hanisch et al. 2010; Rommel et al. 2010). Hanisch et al. (2010) found that about a third of the respondents would support cooperative arrangements in energy supply. Applying a CE, Rommel et al. (2010) investigated preferences regarding electricity sector reforms, with only a small sample subgroup preferring electricity from a cooperative.

These theoretical considerations and empirical results have guided the selection of attributes for our CE, which we now turn to.

# 3 Choice Experiments and Experimental Design

## 3.1 Background

According to the household production framework developed by Lancaster (1966) and Rosen (1974), consumers derive utility from characteristics of a good, rather than from the good itself. For example, utility from wine consumption may stem from taste, color, or alcohol content. CEs employ this approach, incorporating such attributes as "utility-sensitive" elements.

Thurstone (1927) laid the ground for random utility models by formally deriving the effect of different stimuli – good characteristics or attributes – on perceived ratings, meaning preferences or choice probabilities. He also stressed that humans are much better in *comparing* alternatives than in judging them individually. The model was formalized by Manski (1977); McFadden (1974) then combined these approaches and developed a statistical model, based on which Louviere and Woodworth (1983) conducted the first CE.

## 3.2 The Formal Model

We assume that individuals can derive utility from consumption of alternative electricity-supply contracts, depending on their attributes, choosing the one with the highest level of utility. We assume a linear indirect utility function $V_i$ and a linearly added identical and independent distributed (iid) extreme value type 1 error term, $\varepsilon_i$, with the cumulative distribution function $F(\varepsilon_i) = \exp(-\exp(\varepsilon_i))$ for each alternative $i$, so that the probability of choosing alternative $j$ is given by

(1) $$\Pr\{Choose\ j\} = \Pr\{V_j(\boldsymbol{A}_j, y - p_j\boldsymbol{A}_j) + \varepsilon_j > V_i(\boldsymbol{A}_i, y - p_i\boldsymbol{A}_i,) + \varepsilon_i \ \forall i \neq j\}$$

where $A_j$ and $A_i$ are the attribute vectors of alternative $i$ and $j$ and $y - p_iA_i$ is the budget constraint or the price of the alternative.

Some manipulation will lead to McFadden's (1974) conditional logit (CL) probability, which is

(2) $$\Pr\{Choose\ j\} = \frac{\exp(V_j)}{\sum_{i=1}^{n}(\exp(V_i)}$$

The linear indirect utility function for alternative $j$ is

(3) $$V_j = \boldsymbol{\beta}\boldsymbol{A}_j$$

where $\boldsymbol{\beta}$ is a parameter vector to be estimated so that

(4) $$\Pr\{Choose\ j\} = \frac{\exp(\boldsymbol{\beta}\boldsymbol{A}_j)}{\sum_{i=1}^{n}(\exp(\boldsymbol{\beta}\boldsymbol{A}_i)}.$$

With the following specification, the maximum likelihood method can be used to estimate $\boldsymbol{\beta}$.

The CL model has some restrictions. First, the iid assumption implies that adding new irrelevant alternatives will not change the current substitution pattern, which is known as the Irrelevance of Independent Alternatives assumption. Second, the CL model assumes homogeneity of respondents. That is, apart from the unobserved iid random deviation, all respondents have identical preferences.

A large number of CL model extensions exist (Louviere et al. 2000) that relax the iid assumption and allow incorporation of scale and preference heterogeneity into estimation. Prominent examples include the nested, random parameters and latent class logit (LCL) models. The LCL is an extension of the CL model, as it endogenously estimates preference classes, that is, finite discrete distributions of preferences. Each class has individual parameter vectors $\boldsymbol{\beta}_s$, where $s$ indicates the class. Parameters for each class are estimated with separate CL models:

(5) $$\Pr\{Choose\ j|s\} = \frac{\exp(\boldsymbol{\beta}_s \boldsymbol{A}_j)}{\sum_{i=1}^{n}(\exp(\boldsymbol{\beta}_s \boldsymbol{A}_i)}$$

Class probabilities are estimated with a multinomial logit model:

(6) $$\Pr\{member\ of\ t\} = \frac{\exp(\boldsymbol{\gamma}_t \boldsymbol{Z})}{\sum_{s=1}^{S}(\exp(\boldsymbol{\gamma}_s \boldsymbol{Z})}$$

where $\boldsymbol{Z}$ are individual specific variables and $\boldsymbol{\gamma_t}$ the corresponding parameters.

The unconditional choice probability is then

(7) $$\Pr\{choose\ j) = \sum_{s=1}^{S} \frac{\exp(\boldsymbol{\gamma}_t \boldsymbol{Z})}{\sum_{s=1}^{k}(\exp(\boldsymbol{\gamma}_s \boldsymbol{Z})} * \frac{\exp(\boldsymbol{\beta}_s \boldsymbol{A}_j)}{\sum_{i=1}^{n}(\exp(\boldsymbol{\beta}_s \boldsymbol{A}_i)}.$$

The number of classes is decided by the researcher, based on statistical measures of fit such as Bayesian Information Criterion (BIC) or Consistent Akaike Information Criterion (CAIC).

## 3.3 Statistical Design

Here, statistical design refers to the alignment of attribute levels for each alternative and Choice Set. The best possible design is a full factorial one, including all possible combinations of levels and alternatives. Various methods (Rose and Bliemer 2008; Street and Burgess 2007; Street et al. 2005) can be applied to reduce the number of possible combinations. Important concepts here are *orthogonality*, meaning that attributes are uncorrelated, and *balance*, where each level of an attribute appears with the same frequency. Designs which are orthogonal and balanced are called orthogonal arrays, which do not confound the main effects. As interaction effects may be confounded with main effects and other interaction effects, extending the design with a fold-over avoids confounding of two-way interaction effects. The fold-over mirrors the design with opposite values for the levels.

# 4 Questionnaire and Choice Experiment

## 4.1 Attribute Choice and Choice Sets

Starting with an initial list of nine attributes, we reduced their number through pre-studies and pre-tests, following the procedure suggested by Coast et al. (2012). Through an expert interview with a representative of a consumer service website and additional interviews with representatives of energy cooperatives and consumers, we then identified the most relevant attributes with respect to utility governance.

As discussed in section 2, three attributes are particularly important with respect to cooperative governance and retail electricity markets – *price transparency*, *participation rights*, and *location* – and *decision making* is a distinct cooperative governance attribute that helps to further specify the participation attribute.[3] In cooperatives, each member has one vote, in contrast to voting rights based on equity in IOFs. The power of a cooperative member is, thus, also related to the *number of owners* of the organization. The more owners the organization has, the lower is the impact of one particular member in a democratically controlled enterprise. *Share of renewable energy* and *price* complete the attribute list. Price is presented in Eurocents per kWh – the form German consumers are most familiar with. We identified two

[3] Participation, as an attribute, here refers to the fundamental *possibility* of participation, whereas democratic decision making refers to the *way* decisions are made.

extreme levels of between 15 and 30 Eurocents per kWh as the minimum and maximum tariffs[4], which we then divided into five Eurocent steps. Price levels were selected in a way to have an impact on choice, but they also should not have completely dominated it. A summary of the seven attributes and the levels used in the CE is provided in Table 2.

**Table 2: Description of Attributes and Levels**

| Attribute | Description | Levels | Coding |
|---|---|---|---|
| Transparency | How a firm communicates pricing policy | Full price transparency | 0 |
| | | Statutory price transparency | 1 |
| Participation | Consumer participation in a firm's decision-making process | Possible | 0 |
| | | Impossible | 1 |
| Decision Making | How a firm makes internal decisions | One member one vote; | 0 |
| | | Proportionate to equity | 1 |
| Location | Distance of company's Headquarters to customers | Non-local (outside 30 km radius) | 0 |
| | | Local (radius of 30 km); | 1 |
| Owners | Number of people sharing company ownership | 1-9; 10-99; 100-999; >1000 | Dummy Coded |
| Renewables | Share of renewable energy | 0%; 33.3%; 66.6%; 100% | Dummy Coded |
| Price | Price per kWh in Eurocents | 15; 20; 25; 30 | 0; 1; 2; 3 |

Respondents were likely to have different tariffs; a common status quo alternative was, thus, not realistic. An opt-out option (i.e. neither alternative is chosen) would also not have been useful, because all respondents consume electricity. Hence, we decided on choice sets with two alternatives and no opt-out or status quo option, explaining to

[4] We used a consumer website to identify minimum and maximum price levels based on average tariffs, including fixed monthly costs, special offers, and prepaid packages.

participants that these alternatives would result from a hypothetical search for a new electricity supplier, a procedure commonly applied in CEs in network industries (Hensher et al. 2005).

The final experimental design consisted of an orthogonal array with its fold-over, generated with the software package NGENE (ChoiceMetrics 2012) and finally comprised of 48 Choice Sets arranged into four blocks. Each respondent was asked to fill in one randomly assigned block of twelve Choice Sets with two alternatives each.

## 4.2 Sample and Descriptive Statistics

We implemented the questionnaire and CE using *Unipark*, an online environment for survey research. Respondents were recruited through mailing lists of the universities of the authors, covering students and employees. A link was sent to potential participants requesting that they take part in an approximately 15 minute-long online survey.

We are aware of the bias introduced by this sampling process. Data obtained from such non-probability sampling cannot be statistically generalized, thus the procedure demands additional justification. When only certain members of a population are of interest, non-probability sampling targeted at specific sub-populations may be the best available alternative to achieve a sufficiently large number of observations. In cases where a problem is relatively under-researched, a small and easily available sample may be a good starting point for initially exploring it (Henry 1990, p.23f.). In addition, the costs for sampling conveniently available respondents are substantially lower.[5] Our reasoning for recruiting subjects via non-probability sampling was motivated by a mix

[5] For further information on the merits and demerits of non-probability sampling and an overview on different sampling designs, see Henry (1990, p.17ff.).

of these factors. Our sample is strongly biased towards highly educated, environmentally aware people. This bears the advantage that we have a larger chance that the respondents would understand the CE and that the attributes are more relevant than it would be with the overall population. In an explorative study like this, this point can be of critical importance. We had good reason to believe that the attributes of the CE would not be similarly relevant for all groups. For instance, interviews in the pre-study indicated that "governance" plays a role especially for the young and those following an environmentally-friendly lifestyle. Similar evidence is available for pro-environmental consumption choices in other contexts in Germany (Achtnicht 2011). It was, consequently, important to address the sampling bias by controlling for observed heterogeneity and by critically reflecting on potential confounding factors and selection bias (Henry 1990).

The questionnaire began with a brief introductory text. Next, respondents were asked to provide some basic information, including income, age, and gender. Then the CE was introduced, with all attributes being described in detail. During the whole CE, attribute descriptions were available for respondents by drawing their mouse over attributes and levels. On each screen of the online survey, respondents could provide feedback and comments. From such qualitative comments, we can conclude that the level of understanding of the CE was generally good, even though in rare cases some attributes were not fully understood. In the next part of the questionnaire, respondents were presented with questions on their energy use and knowledge, including whether they have switched their supplier in the past or purchase renewable energies. The last part of the survey asked for environmental and political attitudes as well as knowledge and awareness of cooperatives.

The survey was conducted from 18 January 2012 to 27 February 2012. Out of the 886 respondents who opened the online survey, 275 (31.04%) completed the questionnaire and 287 respondents completed or partly completed the CE. Summary statistics of key variables are presented in Table 3.

**Table 3: Summary Statistics for Survey Variables**

| Name | Description | Obs. | Mean | SD | Min | Max |
|---|---|---|---|---|---|---|
| Sex | = 1 if female | 287 | 0.51 | 0.50 | 0 | 1 |
| Age | Age in years | 287 | 29.04 | 9.59 | 18 | 99 |
| Education | Education on ordinal scale, with 1 = no formal education and 11 = post-graduate degree | 285 | 7.69 | 2.01 | 1 | 11 |
| Income | Monthly household income in Euros | 238 | 2,251.74 | 7,404.68 | 0.00 | 100,000.00 |
| Household size | Number of people living in household | 287 | 2.22 | 1.23 | 1 | 11 |
| Special knowledge | = 1 if respondent has background in electrical engineering etc. | 265 | 0.17 | 0.38 | 0 | 1 |
| Consumption | Electricity consumption per year in kWh | 134 | 2,557.28 | 3,203.10 | 1.27 | 35,000.00 |
| Expenditures | Electricity expenditure in Euros per month | 181 | 58.95 | 91.75 | 1.00 | 1,200.00 |
| Tariff | Currently paid price in | 111 | 22.39 | 3.57 | 5.00 | 30.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Eurocent per kWh | | | | | |
| Changed | = 1 if respondent has changed supplier | 278 | 0.69 | 0.47 | 0 | 1 |
| Green Party | = 1 if respondent would vote for Green Party in next election | 287 | 0.42 | 0.49 | 0 | 1 |
| Transparent | 5-point Likert scale ranking if the electricity market is perceived as transparent (1 = highest perceived transparency to 5 = lowest perceived transparency) | 230 | 4.08 | 0.95 | 1 | 5 |

It can be seen that the gender ratio was balanced and respondents were relatively young and well-educated. Since education was measured on an ordinal scale, the mean of 7.69 represents an undergraduate university or college degree. Households were relatively small and incomes mostly below the German average.[6] One question asked about special knowledge on energy issues, such as having an engineering degree or participating in professional activities in the field. About 17 percent of the respondents had prior knowledge of energy issues. More than half of the respondents provided

[6] Two respondents indicated a monthly income of 50,000 and 100,000 Euros. Although these numbers seem exceptionally high, we have no reason to believe that respondents indicated false information. The same applies to the high electricity expenditures. We have, nonetheless, kept the data in the analysis. A drawback is the high number of zero incomes, often resulting from students living on scholarships or transfers.

some data on household energy consumption and costs, indicating good knowledge of prices and tariffs. On average, surveyed households consumed about 2,500 units per year, paid roughly 60 Euros a month, and purchased their electricity at 22 Eurocents per kWh. More than two thirds of the respondents have changed their electricity distribution company at least once. About 40 percent would vote for the Green Party in future elections, which is extremely high compared to the average votes of less than ten per cent the Green party receives in elections. It is a clear indication that our sample is biased towards a more environmentally sensitive population.

We also asked respondents whether they felt that the price setting of utilities is transparent. With an average of more than four, respondents seem to perceive pricing as highly non-transparent.

# 5 Results

## 5.1 Conditional Logit and Latent Class Logit Results

Table 4 reports results of three specifications of the CL model.

**Table 4: Estimation Results Conditional Logit models**

| | Basic | Interactions | Interactions & Ln (Income) |
|---|---|---|---|
| Transparency | -0.770*** | -0.713*** | -0.759*** |
| | (-8.84) | (-7.21) | (-7.21) |
| Participation | -0.537*** | 0.975* | 1.026* |
| | (-5.88) | (1.93) | (1.87) |
| Decision Making | -0.0309 | -0.091 | -0.039 |
| | (-0.36) | (-0.90) | (-0.37) |
| Location | 0.787*** | 0.796*** | 0.752*** |
| | (7.96) | (6.96) | (6.41) |
| Owners_10-99 | 0.156 | 0.228* | 0.306** |
| | (1.32) | (1.65) | (2.09) |
| Owners_100-999 | 0.143 | 0.158 | 0.169 |
| | (1.43) | (1.33) | (1.29) |
| Owners_>1000 | 0.0699 | 0.170 | 0.311** |
| | (0.55) | (1.15) | (2.06) |
| Renewables_33% | 1.944*** | 1.785*** | 1.857*** |
| | (14.04) | (6.67) | (5.89) |
| Renewables_66% | 3.039*** | 2.856*** | 3.395*** |
| | (21.50) | (6.22) | (5.93) |
| Renewables_100% | 4.699*** | 4.336*** | 5.045*** |
| | (23.54) | (6.34) | (5.95) |
| Price | -1.055*** | -1.055*** | |
| | (-20.89) | (-18.21) | |
| Participation x Age | | -0.025*** | -0.024** |
| | | (-2.73) | (-2.32) |
| Participation x Transparent | | -0.214** | -0.205* |
| | | (-2.19) | (-1.84) |
| Renewables x Changed | | 0.410*** | 0.340*** |
| | | (4.72) | (3.47) |
| Renewables x Green Party | | 0.504*** | 0.562*** |
| | | (5.38) | (5.32) |
| Renewables x | | -0.061 | -0.151** |

| | | | |
|---|---|---|---|
| Transparent | | | |
| | | (-1.23) | (-2.39) |
| Price/Ln(Income) | | | -1.226*** |
| | | | (-16.13) |
| Respondents | 287 | 225 | 187 |
| Observations | 3404 | 2702 | 2249 |
| Pseudo $R^2$ | 0.484 | 0.513 | 0.499 |
| $\chi^2$ | 2284.8*** | 1920.8*** | 1554.3*** |
| Log Likelihood (Null) | -2359.5 | -1872.9 | -1558.9 |
| Log Likelihood | -1217.1 | -912.5 | -781.7 |

*t* statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The first model is basic, including only the attributes. In the second model, we added interaction variables of socio-demographic and attitude data with attributes. The third model also includes an adjusted price attribute. Dividing the price attribute by the logarithm of income allows variation in the marginal utility of income across respondents.

As indicated by the $\chi^2$-statistics, all models are statistically significant at the one percent level. The attribute coefficients display the expected signs. Transparency, Participation and Decision Making have negative coefficients, meaning that respondents prefer more price transparency over less, possibilities of participation over non-participation, and democratic decision making. Location has a positive sign, implying that local distribution companies are preferred. The Owners dummies are all positive. Companies with a higher number of owners are preferred. The same applies to the Renewables dummies, revealing a preference for higher share of renewable energy.[7]

The negative coefficient for Price indicates that, as expected, lower tariffs are preferred over higher. In model 1, all coefficients are statistically significant except Decision Making and the Owners dummies, which are also not jointly statistically significant. In model 2, we included four interaction terms to derive inferences about the influence of case-specific variables on attributes. Our sample is (intentionally) biased towards the young, Green Party voters, and consumers with experience in switching suppliers. Thus, we have specifically controlled for these socio-demographic and attitudinal sample-selection biases by interacting Age with Participation, Perception of price-setting transparency with Participation and Renewables, and Green Party and Company Changed with Renewables. The negative sign of the Participation x Age coefficient indicates that, with increasing age, participation becomes more important. The negative sign of Participation x Transparent implies that people perceiving price setting as non-transparent become more interested in participation.[8]

Respondents who had changed suppliers, would vote for the Green Party, and rated price setting in the electricity market as transparent exhibit a stronger preference for renewable energies. Model 3 shows that higher-income respondents care less about

[7] We tested for a linear trend in utility in the basic CL model. The Wald test results indicate that the coefficients are statistically significantly different. $H_0$: Slope zero to 33% = Slope 33% to 66%: p = 0.0002; $H_0$: Slope 33% to 66% = Slope 66% to 100%: p = 0.39; $H_0$: Slope zero to 33% = Slope 66% to 100%: p = 0.0001; $H_0$: All slopes equal: p = 0.0005.

[8] It should be noted that the sign for Participation changes because the marginal effect of the attribute on utility is not $\beta$ but $\beta - \alpha z$, where z is the case-specific variable and $\alpha$ is the corresponding parameter. Taking the means of the two interaction variables will lead to a marginal effect for Participation of -0.611, which is close to the marginal effect in the basic model of -0.537. It is worth mentioning that respondents of the average sample age, 29, who regard the electricity market as transparent would have a small positive marginal effect. Hence, they would prefer that participation not be possible.

price. The marginal effect of Price, which can be interpreted as a change in income and, hence, is its marginal utility, is calculated as $\beta_{price}$ divided by ln(Income).[9]

In order to account for unobserved heterogeneity, we use a LCL model. In this model, we assume discrete distribution of preferences. We decided for a three class model based on first, an observation of the plausibility of the results and second on BIC. Table 5 shows the log likelihood values, BIC, as well as AIC and CAIC for LCL models from two to six classes. The CAIC punishes an increase in parameters, which lead to the lowest value in the two class model. The BIC tends towards a three class model and the AIC to a five class model. However, we will report the results of the three class model as it turned out useful in the interpretation of the data.

**Table 5: Information Criteria of LCL models.**

| Classes | LLF | Nparam | CAIC | BIC | AIC |
|---|---|---|---|---|---|
| 2 | 670.092 | 28 | **1526.552** | 1498.552 | 1396.184 |
| 3 | 620.987 | 45 | 1541.493 | **1496.493** | 1331.973 |
| 4 | 592.968 | 62 | 1598.608 | 1536.608 | 1309.937 |
| 5 | 572.076 | 79 | 1669.976 | 1590.976 | **1302.152** |
| 6 | 576.231 | 96 | 1791.438 | 1695.438 | 1344.463 |

[9] Note that the lower number of observations results from the large number of zero income observations which drop out of the estimation in model 3. Given that the coefficients of model 2 and model 3 are fairly close, this change in sample does not seem to introduce a selection bias.

**Table 6: Estimation Results Latent Class Logit Model**

| | Class 1 | Class 2 | Class 3 |
|---|---|---|---|
| Transparency | -4.396*** | 0.137 | -0.734*** |
| | (-4.73) | (0.34) | (-4.27) |
| Participation | -8.944*** | -0.836** | -0.155 |
| | (-4.60) | (-2.42) | (-0.91) |
| Decision Making | 3.181*** | -1.163** | -0.339* |
| | (2.84) | (-2.55) | (-1.90) |
| Location | 9.868*** | 1.224*** | 0.788*** |
| | (4.24) | (3.31) | (4.02) |
| Owners_10-99 | 2.372*** | -0.158 | 0.537** |
| | (2.98) | (-0.33) | (2.02) |
| Owners_100-999 | -1.412*** | 0.450 | 0.005 |
| | (-2.74) | (1.05) | (0.02) |
| Owners_>1000 | 0.711 | -0.079 | 0.666*** |
| | (0.82) | (-0.14) | (2.95) |
| Renewables_33% | 8.905*** | 1.954*** | 1.243*** |
| | (6.71) | (3.12) | (5.15) |
| Renewables_66% | 19.25*** | 2.027*** | 2.758*** |
| | (5.92) | (3.75) | (9.82) |
| Renewables_100% | 27.66*** | 3.219*** | 4.005*** |
| | (6.27) | (3.56) | (12.57) |
| Price | -5.904*** | -2.714*** | -0.247*** |
| | (-5.88) | (-7.19) | (-3.41) |
| Class Share | 0.499 | 0.210 | 0.291 |
| Respondents | 287 | 287 | 287 |
| Observations | 3404 | 3404 | 3404 |
| Pseudo $R^2$ | 0.806 | 0.715 | 0.453 |
| $\chi^2$ | 1253.1*** | 467.5*** | 412.4*** |
| Log Likelihood (Null) | -777.4 | -326.8 | -454.7 |
| Log Likelihood | -150.8 | -93.04 | -248.5 |

*t* statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6 presents estimation results of a three-class LCL model. The overall model is statistically significant at the one percent level. Class 1 is the largest, with a share of 50 percent. Classes 2 and 3 have shares of 21 and 29 percent, respectively.

The coefficient of Transparency is large, negative, and statistically significant in Class 1; smaller, yet also statistically significant, in Class 3; and close to zero in Class 2. Participation has the expected negative sign in all classes, but is particularly large and statistically significant at the one percent level in Class 1. Members of Class 1 also prefer Decision Making proportionate to equity. In all three classes, local utilities are preferred over distant ones, with a particularly large coefficient in Class 1. Coefficients of the Owners dummies are jointly significant at the one percent level in Class 1 and Class 3. In both cases, companies with either a few or many members are preferred. The Renewables dummies and Price are highly significant in all classes and display the expected signs. In the LCL estimation, we included case-specific variables in the membership function to account for observed heterogeneity.

**Table 7: LCL Membership Function**

| Variable | Class1 | Class2 |
|---|---|---|
| Age | -0.036 | 0.039 |
| Changed | -1.036 | -1.343 |
| Green Party | 0.987 | -1.364 |
| Transparent | 0.215 | 0.064 |
| Ln(Income) | 0.758 | 0.726 |
| Constant | -4.451 | -5.67 |

Class 3 is the base category, for which values are zero. Younger people are more likely to be members of Class 1 and less likely members of Class 2. Those who have already changed distribution companies are more likely to be members of Class 3. Green Party voters are more likely to be members of Class 1 and less likely to belong to Class 2. Those who perceive the price setting as non-transparent and richer people are also more likely to be members of Class 1 and 2.

## 5.2 Willingness to pay analysis

Table 8 provides estimates and confidence intervals for WTP for all estimated models.

**Table 8: Confidence intervals (95 percent) for WTP values by models**

| | CL Basic Model | | | LCL Three-Class Model | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Class 1** green participators | | | **Class 2** price conscious democrats | | | **Class 3** change makers | | |
| | **WTP** | **lower** | **upper** | **WTP** | **lower** | **upper** | **WTP** | **lower** | **upper** | **WTP** | **lower** | **upper** |
| Transparency | -3.65 | -4.50 | -2.79 | -3.72 | -4.31 | -3.13 | 0.25 | -1.15 | 1.66 | -14.86 | -26.54 | -3.17 |
| Participation | -2.54 | -3.33 | -1.75 | -7.57 | -8.68 | -6.46 | -1.54 | -2.72 | -0.35 | -3.13 | -9.60 | 3.32 |
| Decision Making | -0.14 | -0.94 | 0.64 | 2.69 | 1.33 | 4.05 | -2.14 | -3.42 | -0.86 | -6.85 | -15.27 | 1.55 |
| Location | 3.72 | 2.79 | 4.65 | 8.35 | 6.48 | 10.23 | 2.25 | 0.88 | 3.62 | 15.94 | 5.58 | 26.30 |
| Owners_10-99 | 0.74 | -0.35 | 1.83 | 2.00 | 0.92 | 3.09 | -0.29 | -2.03 | 1.45 | 10.86 | -0.912 | 22.63 |
| Owners_100-999 | 0.68 | -0.25 | 1.61 | -1.19 | -2.01 | -0.38 | 0.82 | -0.69 | 2.35 | 0.09 | -10.14 | 10.33 |
| Owners_>1000 | 0.33 | -0.85 | 1.52 | 0.60 | -0.78 | 1.99 | -0.14 | -2.13 | 1.84 | 13.47 | 2.13 | 24.82 |
| Renewables_33% | 9.21 | 8.14 | 10.26 | 7.54 | 6.50 | 8.58 | 3.59 | 1.83 | 5.36 | 25.15 | 9.82 | 40.48 |
| Renewables_66% | 14.40 | 13.15 | 15.64 | 16.29 | 14.70 | 17.89 | 3.73 | 2.06 | 5.40 | 55.81 | 23.97 | 87.66 |
| Renewables_100% | 22.26 | 20.91 | 23.61 | 23.42 | 22.34 | 24.50 | 5.92 | 3.44 | 8.41 | 81.04 | 36.08 | 126.01 |

WTP values are calculated by dividing attribute coefficient by Price coefficient. Resulting values indicate the monetary amounts respondents are willing to pay for marginal improvement in an attribute. Upper and lower limits form the confidence intervals of WTP values, calculated with the delta method (Hole 2007) at a 95% confidence level. The larger the gaps are between these limits, the noisier the data.

A WTP value of 3.72 for Location in the first column, for example, means that, on average, respondents are willing to pay an additional 3.72 Eurocent per kWh for regional suppliers. For a change from statuary price transparency to full price transparency, respondents are willing to pay 3.65 Eurocent per kWh. For the two four-level attributes, the reference category is the first level. For an increase from zero to a 33% share of renewable energy, respondents are willing to pay 9.21 Eurocent; for an increase from zero to 66%, the WTP is 14.4 Eurocent. The WTP for increasing from 33% to 66% is, thus, 5.19 Eurocent.

It turns out that, on average, Renewables and Price dominate the choices and contribute to the largest share of utility, followed by Location, Transparency and Participation. In the LCL model, members of Class 1 put special emphasis on renewable energy, locally produced power, and right to participate in the decision making process. Therefore we name this class "green participators". Respondents from Class 2 are characterized by rather low WTP values, but show a preference for locally produced power and renewable energy. Respondents in Class 2 also have a positive WTP for democratic decision making that lies within the 95% confidence interval. This class can be described as the "price conscious democrats". Class 3 is marked by cost insensitivity and displays very high WTP values, especially for Renewables. The other important attributes for this group are Transparency and Location. We name this class "change makers".

# 6 Discussion

Overall, our findings indicate that the most important attributes for respondents are Price and Renewables but lower WTP also exists for the governance attributes Transparency, Participation, and Location. The Owners attribute is not decisive; with respect to Decision Making, only members of Class 2 have a statistically significant higher WTP of about two Eurocents.

Overall, coefficient signs and WTP values of the governance attributes are in line with the Transaction Cost Economics framework we have developed. Locally produced electricity may reduce information and enforcement costs. Consumers can more easily observe how their energy is produced, which creates trust. An alternative explanation may be distrust towards large IOFs. Participation possibilities are important as well. The implied user-owner identity can be a valuable mechanism to protect against market-power abuse by former monopolists. Likewise, price transparency is valued highly. Given the credence good characteristics of electricity, this mechanism can reduce information costs and quality uncertainty. It should be clear by now that cooperatives are inherently advantageous in this respect. Nonetheless, transparent pricing could be mimicked by non-cooperative electric utilities.

Democratic decision making is the only distinct cooperative governance mechanism included in our CE. In the basic model, it is not statistically significantly different from zero. In the LCL model, our results indicate a positive and statistically significant WTP only for Class 2, representing one fifth of the sample. For Class 1, representing half of the respondents, democratically controlled utilities seem actually *less* attractive; we speculate that these respondents perceive the *one member, one vote* principle as inefficient or outdated.

Of course, the negative effect of Decision Making in Class 1 does not imply that consumers pay less for electricity from cooperatives. WTP for the other typical cooperative attributes appear to outrank the rather small effects of Decision Making in Class 1. In Germany, electricity supply cooperatives are mainly engaged in the field of renewable energy. One important finding of our research is, thus, that price premiums paid for electricity from cooperatives can to a large extent be attributed to consumer WTP for renewable energies.

As any other method, CEs have strengths and weaknesses. As a Stated Preferences Method, they are subject to hypothetical bias and strategic behavior (see e.g. Hensher 2010; Murphy et al. 2005). Further, CEs assume full rationality of respondents, based on assumptions of neoclassical economic demand theory. In practice, however, rationality requirements are limited to the choice task: the required information is listed in the attributes and rationality is reduced to choosing the best option. Compared to choices in the real world, CEs are fairly simple. It should be noted that the complexity of real-life decision making cannot be compared to the online survey used here. The particular strength of the CE method lies in its ability to single out the valuation of particular attributes, which has proven useful for the problem studied in this paper. The extremely high WTP of up to 80 Eurocent per kWh may, however, also point towards some problems with the biased sample and the hypothetical setting respondents were placed in. WTP for Participation increases with age. But, as our sample is biased towards the young, the average effect is likely over-estimated and can be corrected by using the respective coefficients provided in Table 4. The same applies to Green Party voters and people with experience in changing suppliers. Both variables interact with the coefficients of the renewable energy estimate, and respondents seem over-represented compared to the general population. Correcting for this observed heterogeneity would result in lower estimates for WTP for renewable energy.

Ultimately, it would be worth repeating the CE with a random sample of the general population or a consumer panel to control for unobserved heterogeneity and possibly derive more robust recommendations for utilities. In our limited sample, consumer WTP for renewable energy is substantial, a result also found in other empirical studies, which we have supplemented by focusing on WTP for the *organization* of the retail electricity consumption process. In principle, utilities could adapt more transparent policies or engage in local production to attract additional customers or to set higher tariffs. But just how far companies are really willing to take consumer demands into account and what the particular costs of such reforms might be, require substantiation through further research.

## 7 Summary and Conclusion

In this paper, we have investigated whether Cooperative Governance attributes contribute to greater WTP for electricity. From a theoretical perspective, we have argued that these attributes can solve contemporary electricity-market challenges. To address this question empirically, we conducted an online CE with a convenience sample of 287 respondents. Our results show that respondents have a particularly high WTP for renewable energies, but full price transparency, possibility to participate, and company proximity also increased their WTP. Although we find that supplier governance matters, we did not find strong evidence that respondents support democratic decision making as practiced in cooperatives. WTP varies substantially with age, income, past change of supplier and perception of market transparency.

Using an LCL model, we have identified three classes of consumers, varying strongly in magnitude and direction of preferences.

Our analysis here has focused on the role of consumers. Other important aspects in the German debate on energy transition – notably the highly disputed Renewable Energy Act – have been neglected. Also, in most countries, cooperatives fall under a completely different legal framework and are subject to different taxation than in Germany. International comparison of such conditions on the production side may generate valuable insights on consumer influence in shaping the organization of an economy's energy system. At this stage, our findings suggest that consumers in Germany do play a role in the energy system, especially by creating additional demand for renewable energies, though their importance in affecting the organization of the system seems to be relatively small. Whether such governance characteristics can play a critical role on the production side requires further research.

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## References

Abebe, G.K., Bijman, J., Kemp, R., Omta, O., Tsegaye, A., 2013. Contract farming configuration: Smallholders' preferences for contract design attributes. Food Policy, 40, 14–24.

Achtnicht, M., 2011. Do environmental benefits matter? Evidence from a choice experiment among house owners in Germany. Ecological Economics, 70, 2191–2200.

Akerlof, G. A., 1970. The Market for Lemons: Quality Uncertainty and the Market Mechanism. Quarterly Journal of Economics, 84, 488–500.

Álvarez-Farizo, B., Hanley, N., 2002. Using conjoint analysis to quantify public preferences over the environmental impacts of wind farms: An example from Spain. Energy Policy, 30, 107–116.

Baumol, W.J., 1977. On the proper cost tests for natural monopoly in a multiproduct industry. American Economic Review, 67, 809–822.

Bontrup, H.J., Marquardt, R.M., 2010. Kritisches Handbuch der deutschen Elektrizitätswirtschaft. edition sigma, Berlin.

Bonus, H., 1986. The cooperative association as a business enterprise: A study in the economics of transactions. Journal of Institutional and Theoretical Economics, 142, 310–339.

Borchers, A.M., Duke, J.M., Parsons, G.R., 2007. Does willingness to pay for green energy differ by source? Energy Policy, 35, 3327–3334.

Bougherara, D., Ducos, G., 2006. Farmers' preferences over conservation contract flexibility and duration: An estimation of the effect of transaction costs using Choice Experiment. http://prodinra.inra.fr/#ConsultNotice:11024 (27 May, 2012).

Bundesnetzagentur, 2012. Monitoringbericht 2011. http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2011/MonitoringBericht2011.pdf?__blob=publicationFile&v=2 (30 June, 2012).

Bundesnetzagentur; Bundeskartellamt 2013. Monitoringbericht 2012. http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2012/MonitoringBericht2012.pdf?__blob=publicationFile&v=2, (1 September, 2012).

Chaddad, F.R., Cook, M.L., 2004. Understanding new cooperative models: An ownership–control rights typology. Review of Agricultural Economics, 26, 348–360.

Chaddad, F.R., Iliopoulos, C., 2013. Control Rights, Governance, and the Costs of Ownership in Agricultural Cooperatives. Agribusiness, 29, 3–22.

ChoiceMetrics, 2012. NGene 1.1.1 User Manual & Reference Guide. http://www.choice-metrics.com/documentation.html

Coase, R.H., 1937. The nature of the firm. Economica, 4, 386–405.

Coase, R.H., 1960. The problem of social cost. The Journal of Law and Economics, 3, 1–44.

Coast, J., Al-Janabi, H., Sutton, E.J., Horrocks, S.A., Vosper, A.J., Swancutt, D.R., Flynn, T.N., 2012. Using qualitative methods for attribute development for discrete Choice Experiments: Issues and recommendations. Health Economics, 21, 730–741.

Cornforth, C., 2004. The governance of cooperatives and mutual associations: A paradox perspective. Annals of Public and Cooperative Economics, 75, 11–32.

Degenhart, H., 2010. Die Finanzierung von Biomasse-Nahwärme-Genossenschaften: Ein Überblick. Working Paper Series in Business and Law, Nr. 6. http://www.leuphana.de/fileadmin/user_upload/Forschungseinrichtungen/ifwr/files/Arbeitpapiere/WPBL-No6.pdf (6 May 2012).

Dimitropoulos, A., Kontoleon, A., 2009. Assessing the determinants of local acceptability of wind-farm investment: A Choice Experiment in the Greek Aegean Islands. Energy Policy, 37, 1842–1854.

Draheim, G., 1955. Die Genossenschaft als Unternehmungstyp. Vandenhoeck und Ruprecht, Göttingen.

Flieger, B., Klemisch, H., 2008. Eine andere Energiewirtschaft ist möglich: Pionierfunktion neuer Energiegenossenschaften. http://www.cl-netz.de/foren/cl.medien.contraste/Schwerpunktthema:-Eine-andere-Energiewirtschaft-ist-m%F6glich-Pionierfunktion-neuer-Genossenschaften-(Teil-1)-55683.html (3 January, 2012).

Granovetter, M., 1985. Economic Action and Social Structure: The Problem of Embeddedness. The American Journal of Sociology, 91, 481–510.

Gros, J., 2009. Die Genossenschaft der Zukunft aus der Sicht des Verbandes. Zeitschrift für das gesamte Genossenschaftswesen, 59, 95–105.

Hanisch, M., Kimmich, C., Rommel, J., Sagebiel, J., 2010. Coping with power scarcity in an emerging megacity: A consumers' perspective from Hyderabad. International Journal of Global Energy Issues, 33, 189–204.

Hanisch, M., Rommel, J., Müller, M., 2013. The Cooperative Yardstick Revisited: Panel Evidence from the European Dairy Sectors. Journal of Agricultural & Food Industrial Organization, 11, 151-162.

Hansmann, H., 1996. The ownership of enterprise. Belknap Press, Cambridge, Massachusetts.

Henry, G. T., 1990. Practical Sampling. Sage Publications, London, UK.

Hensher, D.A., 2010. Hypothetical bias, choice experiments and willingness to pay. Transportation Research Part B: Methodological, 44, 735–752.

Hensher, D., Shore, N., Train, K., 2005. Households' Willingness to Pay for Water Service Attributes. Environmental and Resource Economics, 32, 509–531.

Hole, A., 2007. A comparison of approaches to estimating confidence intervals for willingness to pay measures. Health Economics, 16, 827–840.

Holstenkamp, L., Müller, J. R., 2013. Zum Stand von Energiegenossenschaften in Deutschland. Ein statistischer Überblick zum 31.12.2012. Arbeitspapierreihe Wirtschaft & Recht. Leuphana Universität, Lüneburg. http://www.leuphana.de/fileadmin/user_upload/PERSONALPAGES/_ijkl/janner_steve/Homepage_Master/wpbl_14.pdf, checked on 8/7/2013 (3 August, 2013).

Holstenkamp, L., Ulbrich, S., 2010. Bürgerbeteiligung mittels Fotovoltaikgenossenschaften: Marktüberblick und Analyse der Finanzierungsstruktur. Working Paper Series in Business and Law, Nr. 8. http://www.leuphana.de/fileadmin/user_upload/Forschungseinrichtungen/ifwr/files/Arbeitpapiere/WPBL8-101215.pdf (6 May 2012).

International Cooperative Alliance (ICA), 2012. Statement on the co-operative identity. http://www.ica.coop/coop/principles.html (20 February, 2012).

Jansen, D., 2012. Local utilities in the German electricity market and their Role in the diffusion of innovations in energy efficiency and climate change mitigation. in: Jansen, D., Ostertag, K., Walz, R. (Eds.), Sustainabiliy in innovations in the electricity sector. Springer, Heidelberg, 1–26.

Jensen, M. C., Meckling, W. H., 1976. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. Journal of Financial Economics, 3,305–360.

Kaenzig, J., Heinzle, S. L., Wüstenhagen, R. 2013. Whatever the customer wants, the customer gets? Exploring the gap between consumer preferences and default electricity products in Germany. Energy Policy, 53, 311–322.

Klemisch, H., Maron, H., 2010. Genossenschaftliche Lösungsansätze zur Sicherung der kommunalen Daseinsvorsorge. Zeitschrift für das gesamte Genossenschaftswesen, 60, 3–13.

Lancaster, K., 1966. A new approach to consumer theory. The Journal of Political Economy, 74, 132–157.

Laurinkari, J., 1994. Principles of the cooperative system. in: Dülfer, E., Laurinkari, J. (Eds.), International Handbook of Cooperative Organizations. Vandenhoeck & Ruprecht, Göttingen, 708–716.

Louviere, J.J., Hensher, D.A., Swait, J.D., Adamowicz, W., 2000. Stated choice methods: Analysis and applications. Cambridge Univ. Press, Cambridge.

Louviere, J.J., Woodworth, G., 1983. Design and analysis of simulated consumer choice or allocation experiments: An approach based on aggregate data. Journal of Marketing Research, 20, 350–367.

Manski, C.F., 1977. The structure of random utility models. Theory and Decision, 8, 229–254.

McFadden, D., 1974. Conditional Logit analysis of qualitative choice behavior. in: Zarembka, P. (Ed.), Frontiers in Econometrics. Academic Press, 105–142.

Menke, N., 2009. Kooperation in der Energiewirtschaft: Chancen und Grenzen der Rechtsform eG. Zeitschrift für das gesamte Genossenschaftswesen, 59, 175–179.

Meyerhoff, J., Ohl, C., Hartje, V., 2010. Landscape externalities from onshore wind power. Energy Policy, 38, 82–92.

Michelsen, C.C., Madlener, R., 2012. Homeowners' preferences for adopting innovative residential heating systems: A discrete choice analysis for Germany. Energy Economics, 34, 1271–1283.

Müller, J.R., Holstenkamp, L., 2012. Governance and financing of German energy cooperatives. Paper presented at the International Conference "Cooperative Responses to Global Challenges," 21–23 March 2012, Humboldt-Universität zu Berlin, Germany.

Müller, J.R., Rommel, J., 2011. Is there a future role for urban electricity cooperatives? The case of Greenpeace Energy. in: Ramos-Martín, J.; Giampietro, M.; Ulgiati, S.; Bukkens, S.G.F. (Eds.):

Can We Break the Addiction to Fossil Energy? Proceedings of the 7th Biennial International Workshop Advances in Energy Studies Barcelona, Spain 19–21 October 2010. Universitat Autònoma de Barcelona, 185–195.

Müller, J. O., 1976. Voraussetzungen und Verfahrensweisen bei der Errichtung von Genossenschaften in Europa vor 1900: Analyse der Strategien des Genossenschaftsaufbaus in den Frühstadien industriewirtschaftlicher Entwicklung. Vandenhoeck und Ruprecht, Göttingen.

Murphy, J.J., Allen, P.G., Stevens, T.H., Weatherhead, D., 2005. A Meta-analysis of Hypothetical Bias in Stated Preference Valuation. Environmental and Resource Economics, 30, 313–325.

Reise, C., Liebe, Ulf, Mußhoff, Oliver, 2012. Präferenzen von Landwirten bei der Gestaltung von Substratlieferverträgen für Biogasanlagen : ein Choice-Experiment. German Journal of Agricultural Economics, 61, 162–177.

Remoundou, K., Kountouris, Y., Koundouri, P., 2012. Is the value of an environmental public good sensitive to the providing institution? Resource and Energy Economics, 43, 381–395.

Roe, B., Teisl, M.F., Levy, A., Russell, M., 2001. US consumers' willingness to pay for green electricity. Energy Policy, 29, 917–925.

Rommel, K., Hanisch, M., Deb, K., Sagebiel, J., 2010. Consumer Preferences for Improvements of Power Supply Quality: Results from a Choice Experiment in Hyderabad, India and Implications for Energy Policy. Paper presented at the European Conference of the IAEE, 25–28 August 2010, Vilnius, Lithuania.

Rose, J.M., Bliemer, M.C., 2008. Stated preference experimental design strategies. Handbook of Transport Modelling, Elsevier, Oxford, 151–180.

Rosen, S., 1974. Hedonic prices and implicit markets: Product differentiation in pure competition. The Journal of Political Economy, 82, 34–55.

Scarpa, R., Willis, K., 2010. Willingness-to-pay for renewable energy: Primary and discretionary choice of British households' for micro-generation technologies. Energy Economics, 32, 129–136.

Seyfang, G., 2009. The New Economics of Sustainable Consumption: Seeds of Change. Palgrave Macmillan, Basingstoke.

Street, D.J., Burgess, L., 2007. The construction of optimal stated choice experiments: Theory and methods, Wiley series in probability and statistics. Wiley-Interscience, Hoboken.

Street, D.J., Burgess, L., Louviere, J.J., 2005. Quick and easy choice sets: Constructing optimal and nearly optimal stated choice experiments. International Journal of Research in Marketing, 22, 459–470.

Theurl, T., Kring, T., 2002. Governance Strukturen im genossenschaftlichen Finanzverbund: Anforderungen und Konsequenzen ihrer Ausgestaltung. Working Papers IfG Münster. https://www.wiwi.uni-muenster.de/06//nd/fileadmin/documents/workingpapers/AP27.pdf (3 May 2012).

Thurstone, L., 1927. A law of comparative judgment. Psychological Review, 34, 273–286.

Williamson, O.E., 1985. The Economic Institutions of Capitalism. Firms, markets, relational contracting. Free Press, New York.

Williamson, O.E., 1991. Comparative economic organization: The analysis of discrete structural alternatives. Administrative Science Quarterly, 36, 269-296.