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Default vs. Active Choices: An Experiment on Electricity Tariff Switching

Ayse Tugba Atasoy† Reinhard Madlener†‡

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Abstract

In distinct decision environments, consumers often fail to financially optimize their decisions. In liberalized electricity markets, consumers frequently do not optimize their electricity choices and stick with the default providers instead, despite the ability to choose among an increasingly large set of electricity suppliers and benefit from lower cost options. In this paper, we study the effect of different contextual features of the choice environment (i.e., default and active choice enforcement) and search costs (i.e., high and low) on the quality of electricity contract choices, with the help of a randomized controlled laboratory experiment. We provide evidence that the default contract rule lowers the decision quality compared to the active decision rule in both search cost environments. Default rules lower the quality of contract choices especially for the individuals with lower cognitive ability. Contrary to the expectations, we observe that the number of alternatives has no effect on the quality of electricity contract choices. Our findings have important implications for regulatory rule setting in the electricity market.

JEL Classification: C91, D91, D12, Q48

Keywords: Contract Switching, Electricity Contracts, Default Rules, Search Costs, Decision-making

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1 Introduction

The liberalization of electricity markets has allowed for a significant increase in the number of electricity providers and tariff or contract choices for consumers. Still, despite the large choice set at their disposal, a considerable share of consumers in Germany have never switched their electricity providers or tariff plans and remain with their local suppliers, which are often defined by the regulator for different regions. (Bundesnetzagentur, 2015, 2018). As the default suppliers generally do not offer the most competitive electricity prices, consumers often forego financially more favorable tariff or contract options by sticking to their standard electricity tariffs and providers. If consumers do not have strong preferences toward the default provider, having a standard electricity contract might be welfare-decreasing. Active decisions of consumers would not only help the new suppliers to reach a critical number of customers, but would also promote competition and prevent incumbent suppliers from having a dominant position and exercising market power, thus resulting in more efficient market outcomes.

A number of studies investigate financially suboptimal consumer choices in distinct decision environments, for example with respect to changing health insurance plans (Heiss et al., 2016), finding the optimal cell phone plan based on one’s past consumption (Grubb and Osborne, 2015) or changing electricity tariffs (e.g., Dressler and Weiergraeber, 2019; Hortasgu et al., 2017). While in most of these situations consumers were found to choose options that are not financially optimal (Bhargava et al., 2017), costs associated with searching and processing the information necessary for making such decisions are an important factor that induces suboptimal tariff choices (Honka, 2014). Acquiring and processing the necessary information for making decisions is costly, as analyzing the alternative options and calculating the expected costs tends to be complex and time-consuming despite easy-to-use and powerful online services facilitating just that. Hence, consumers might deliberately stick with their current tariff if they perceive the search and switching costs to be too high. This suggests that consumers might be rationally inattentive. Contrary to the explanation brought by the rational inattention model (Caplin and Dean, 2015), passive decisions might also be explained by behavioral factors if there are psychological distortions in gathering, processing, and attending to the information. That is, costs and benefits associated with taking such decisions might be substantially misweighted by the individuals (Handel and Schwartzstein, 2018).

While costly search is one important channel that might lead to financially suboptimal decision-making, the contextual features of the choice setting might also play a critical role (Altmann et al., 2019). Different policies aim to shape our choices either by setting default options or by enforcing active decision-making (Beshears et al., 2019; Kesternich et al., 2019; Stutzer et al., 2011). For example, we, as consumers, are automatically allocated to specific default tariffs or contracts and in some settings are asked to take an active decision or give our consent. These policies that shape the choice environment affect our capacity to make financial decisions.

The literature extensively documents that decision-makers are biased towards the default options in a given choice set. This “default effect” has been shown to persist in various domains.
For example, we observe default effects in decisions related to health insurance plans (Handel, 2013), retirement plans (Chetty et al., 2014; Madrian and Shea, 2001), organ donations (Johnson and Goldstein, 2003), green electricity use (Ebeling and Lotz, 2015), and enrollment in electricity pricing programs (Fowlie et al., 2019).

Earlier research indicates that consumers typically interpret the options designated as defaults to be the best ones (e.g., Brown and Krishna, 2004; McKenzie et al., 2006). Default options are nonetheless implemented with different motivations. While some defaults serve for an ethical purpose, such as the default options governing organ donations, some others are not tailored towards optimizing consumer choices but rather supplier objectives/benefits. In fact, defaults sometimes constitute financially sub-optimal options for consumers. Yet, disclosing the intention behind a particular default option does not necessarily induce decision-makers’ propensity to opt out (Steffel et al., 2016). Knowing that defaults can have drastic effects, as they make the attributes of the default option disproportionately salient to consumers, alternative choice-promoting policies might protect consumers in specific domains. These might include enforcing active choices by encouraging decision-makers to gather information about the alternative options in their choice set.

Little is known yet about the interaction between costly search and different contextual features of the choice environment. In this paper, we explicitly focus on this gap and study the decision quality of contract choices across (i) distinct choice environments when consumers are either automatically allocated to a default contract or asked to choose actively among options and (ii) under high and low search costs. We capture search costs by varying the number of available contracts in a given choice set.

Optimally switching the electricity tariff plans requires processing information, paying attention to different choice attributes and considering trade-offs among multiple tasks that compete for our attention. Similarly to the experimental set-up by Altmann et al. (2019), we integrate two distinct real-effort tasks that both require cognitive resources in a specific sequence. With this feature of our experimental design, we induce subjects to trade off between cognitive load and accuracy in solving these tasks, simulating the core aspects of the decision situation “consumer switching” in reality.

The aim of our experiment is to investigate the causal effect of different choice interventions and search costs on the switching decisions of electricity tariffs. We measure decision quality on the basis of the ability to choose the financially optimal electricity tariff in a real-effort task pertaining to the electricity contract choices. In the choice environment dimension, we consider the effect of having a default tariff and enforcing an active decision-making for the tariff choice on the decision quality. In the search costs dimension, we investigate the effect of the increased number of alternative electricity tariffs on the decision quality of contract choices. By designing a randomized controlled experiment, we explicitly focus on two questions. First, does enforcing

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1This is equivalent to asking for consent before involving customers in any specific contract plan.
2In our experiment, the decision task is framed as different electricity tariffs; however, the experimental task can be interpreted as changing the contract or the provider as well as the electricity tariffs. Note that we use these terms interchangeably throughout the manuscript.
of active decisions lead to better decision outcomes compared to setting defaults? Second, how do default options and enforcement of active decisions affect choice quality under different search cost scenarios (e.g., high and low search costs)?

Our study makes a number of contributions to the literature. First, we contribute to the growing literature on active vs. passive consumer choices by providing evidence from our experimental design. In line with this broader literature, we document robust evidence that the default options – compared to active decisions – lower the choice quality. Second, our results contribute to the literature on decisions under varying search costs (here mimicked by the number of alternatives in the choice set). In the context of our experimental manipulation, we find no evidence of search costs affecting the tariff switching decisions. Finally, this paper differs from the existing literature as we design a unique randomized controlled experiment to study the interaction between search costs and distinct choice environments framed for the decisions pertaining to the electricity contract switching.

The remainder of the paper is organized as follows. Section 2 describes the experimental design, Section 3 details the experimental procedures and describes the dataset. Section 4 indicates the behavioral predictions and specifies the hypotheses. Section 5 documents the results from the experimental data and the regression analysis for the individual tariff choices. Section 6 concludes and discusses the possible implications.

2 Experimental Design

To explore and better understand the influence of the two dimensions – decision environment and search costs – on the quality of electricity contract choices of individuals, we designed a between-subjects, randomized controlled laboratory experiment. The experiment was run in 15 sessions at RWTH Aachen University’s Experimental Laboratory for Economic Research “AIXperiment” in August 2019.

Table 1: Experimental Design Overview

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<th>Choice Settings</th>
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In a similar spirit as in the experimental design by Altmann et al. (2019), we used two real effort tasks, which we refer to as Tasks A and B.\(^3\) The two real-effort tasks had a specific sequence in each round. First, participants were exposed to Task A for 40 seconds. Task A consisted of three different cognitively challenging computations. The task was to compute three sums and remember them without using a calculator. Each option consisted of six numbers written as text.

\(^3\)In the experimental instructions, they were referred to as Tasks 1 and 2.
These were randomly selected numbers from 1 to 9 without replacement.\(^4\) After the 40 seconds had elapsed, participants could work on solving another task for another 40 seconds, which was specifically about electricity contract switching. The task was to find the lowest electricity tariff in a given year. The electricity consumption of the participants was assumed to be constant and reflecting that of an average four-person household. Participants received 10 cents (in €-ct) for each correctly solved task. After the 40 seconds for solving Task B had also elapsed, participants were asked to enter the sums they calculated from Task A and had 15 seconds to do so. If all the three numbers entered were correct, participants received 50 cents. The experiment consisted of 20 repeated rounds. In the baseline condition, participants were exposed to a blank screen and could solve Task B, but they did not have to.\(^5\) In the “Default Contract” treatment, one of the contracts was randomly selected and participants constantly saw Task B on their screen. This means that in one fourth of all cases, the selected option was also the correct answer to the question, as communicated to the participants in the instructions.\(^6\) In the high search cost environment, the default was randomly selected among six different contracts. In the “Active Choice” environment, participants constantly saw Task B on their screen and none of the options was pre-selected.

While the low search cost environment was measured by a version of Task B with four different electricity contracts, this number was increased in the high search cost environment to six contracts. In our experimental set-up, participants needed to trade off between the cognitive load and the accuracy of their answers to the tasks. That is, they had to trade off between costs and benefits as the payoff for Task A (50 cents) was substantially higher than that of Task B (10 cents). Hence, the specific payoff structure and the cognitive resources required for solving Task A induced participants to think and decide carefully about solving or ignoring Task B. Solving Task B meant spending additional cognitive resources that might negatively interact with the answer given to Task A. Hence, solving Task B came at a cost of reduced cognitive capacity to remember the correct solutions to Task A, as participants might forget about the numbers memorized in Task A after solving Task B.

Since we are not interested in the effect of cognitive resources on the decision quality, we do not vary the difficulty of Task A across the treatments. Yet, Task A in our set-up achieves a more realistic decision framework by implementing two key features: (i) it creates a specific payoff structure, as a correct answer to Task A in a given round pays much higher than the one to Task B; and (ii) it effectively takes available cognitive resources away from the capacity to work on Task B.

The treatment rounds were followed by a post-experimental survey questionnaire. The survey consisted of questions on socio-demographic characteristics, switching behavior, cognitive ability, and economic preferences. Overall, 282 students, who are active members of the AIXperiment Laboratory at RWTH Aachen University, participated in the experiment. The aim of this

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\(^4\) That is, each number in a given set was unique.

\(^5\) In order to maintain a high degree of control, we did not introduce any alternative way of busying/entertaining oneself during this time, as this would have introduced opportunity costs for solving Task B that would have varied at the individual level.

\(^6\) The screenshots and the instructions are provided in the appendix.
experiment was to investigate the causal effect of different choice settings and search costs on the switching decisions of electricity tariffs. The decision quality was measured on the basis of the ability to select the financially optimal electricity tariff in Task B. In the choice-setting dimension, we consider the effect of having a default tariff and enforcing active decision-making on the decision quality. In the search cost dimension, we investigate the effect of an increase in the number of alternative electricity tariffs on the quality of contract choices. That is, while in the “Low Search Costs (LC)” treatment dimension participants had to choose among four different electricity contracts, in the “High Search Costs (HC)” treatment dimension they had to choose between six.

3 Experimental Procedures and Data

3.1 Experimental Procedures

We ran a computerized and incentivized controlled laboratory experiment that constitutes a between-subjects design.

The experiment was programmed using the $z$-Tree software for economic laboratory experiments (Fischbacher, 2007). Subjects were recruited using the online recruitment tool ORSEE (Grenier, 2015). Participants were registered in the subjects pool and had enrolled in different degree programs at one of the universities in the city of Aachen or at universities in the region. Each subject participated only once in the experiment. The experiment was conducted in German.

We implemented a single practice round to familiarize participants with the contents of the experiment. Overall, 283 subjects participated in our experiment. On average, sessions lasted for 50 minutes including the time for the practice round and post-experimental survey. Subjects received, on average, €12.35, including a show-up fee of €6.7.

Each session consisted of twenty rounds and each round of two different real effort tasks displayed in a specific sequence. Writing, communicating with others, and using a calculator were not allowed. The first task (Task A) lasted for 40 seconds and consisted of three different mathematical calculations. Each of these included a sum of six different one-digit numbers, randomly selected from 1 to 9 without replacement. Those numbers were written as text and subjects were asked to calculate the sum of each option and remember the answers. During these 40 seconds, subjects saw the numbers but were not yet able to enter their answers. After this task, they could work on a second task (Task B). This task was contextualized for switching electricity tariffs. The question was to find the financially optimal electricity tariff from a number of contracts presented to the subjects. This task, too, was shown for 40 seconds. Each electricity tariff contained three variables: the monthly electricity costs (in €/month), the electricity price per kWh (in €-ct/kWh), and a one-time bonus payment for choosing the tariff. To calculate the monthly electricity costs, we assumed an annual average consumption of 5100 kWh\(^8\), i.e., a linear

\[\text{Hence, a subject could earn a maximum of 60 cents in a given round and €18 throughout the experiment, if he or she has solved all the experimental tasks correctly.}\]

\[\text{This is equivalent to the average electricity consumed in a four-person household in Germany. We instructed}\]

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relationship between the unit rates of electricity price and monthly electricity costs.\textsuperscript{9} We kept the level of electricity consumption constant so as to avoid additional variation, which made the task not only more complex, but also introduced additional heterogeneity to our experimental sample.\textsuperscript{10} The unit electricity prices were randomly selected (without replacement) from the following set: \{0.24 \text-euro\-ct, 0.25 \text-euro\-ct, 0.26 \text-euro\-ct, \ldots, 0.30 \text-euro\-ct\}. This range reflects a realistic variation of the unit rates in the electricity tariffs offered in Germany in 2019. Similarly to this attribute, we randomly selected the bonus payment per annum from a set of \{\text-euro\,50, \text-euro\,100, \text-euro\,150, \text-euro\,200\}.\textsuperscript{11} Again, these numbers were also selected on the basis of the most commonly offered bonus payments by different providers in Germany.\textsuperscript{12} Clearly, the attributes chosen for each electricity tariff in our experiment are a simplification of the actual tariffs. Yet, they outline the most essential criteria for financially optimizing tariff choices.

There is a substantial difference in the payoff structure of the two tasks. The calibration is intended to strengthen the trade-off when solving the tasks. While Task A can be considered as the main task, Task B serves as a venue to further optimize financial decisions, where the benefits are relatively marginal compared to those of the main task. This means that the subject would be better-off – conditional on having any cognitive limitations – by allocating a larger share of her cognitive resources to Task A, as the payoff for Task A is five times higher than that for Task B.

3.2 Data and Descriptive Analysis

We randomized the treatments within each session. Table 2 shows the summary statistics for all the treatment groups and indicates the summary statistics for the (post-)experimental measures in the sample.

In the post-experimental survey, we included qualitative measures for time preferences and other indicators on individual switching behavior that we think explain part of the variation in the subjects’ answers to Task B. To measure time preferences, we use the survey question by Falk et al. (2018, 2016) with a 5-point Likert scale.\textsuperscript{13} We included this measure, as we hypothesize that intertemporal choices play an important role in the decision of switching electricity tariffs.\textsuperscript{14}

\textsuperscript{9}We included the attribute on the unit prices since solving the task required substantially more time in the absence of this variation. This parameter gives a comparison between the different tariffs. Moreover, the price per kWh is a fixed parameter typically shown in the online platforms to compare different tariff options.

\textsuperscript{10}This is undesirable for the usually smaller sample sizes observed in a laboratory experiment.

\textsuperscript{11}These numbers were selected randomly without replacement in the LC treatment dimension and with replacement for the additional two contracts. This might have an effect on the complexity of the task; however, even in the case that subjects implement a strategy to eliminate irrelevant alternatives, the task should still be more effortful in the HC environment.

\textsuperscript{12}We especially browsed the frequently used comparison portals for residential electricity supply contracts such as www.check24.de or www.stromvergleich.de.

\textsuperscript{13}The question indicates the following statement: “I am prepared to give up something today in order to benefit more from it in the future,” with a Likert scale from “It is not true at all.” to “It is absolutely correct.” with a consistent scale starting from strong to weak time preferences.

\textsuperscript{14}Clearly, the experimental outcomes are not effectively characterized by the intertemporal choices, as subjects are paid out at the end of each session. However, in practice, costs and benefits induced by tariff choices do not take place at the same time. Hence, time preferences might explain part of the variation in (sub)optimal tariff choices.
Moreover, we measure the ability for numeracy following the ‘Berlin Numeracy Test’ explained in Cokely et al. (2012) – a psycho-metrically instrumented test that assesses cognition based on statistical numeracy.\footnote{We use this measure instead of other established cognitive ability or cognitive reflection measures, as our experimental tasks are strongly based on numerical skills, such as comprehending fundamental arithmetical operations. The four questions used in the test were as follows: 1) Imagine if we flipped a coin a thousand times. How many times does head appear in a thousand tosses? ______ of 1000 tosses. 2) Imagine we flip a five-sided dice 50 times. On how many of these 50 tosses would this five-sided die show an odd number as expected (odd numbers: 1, 3, or 5 in this case)? ______ of 50 throws. 3) In a lottery the chance of winning a €10 prize is 1%. If 1000 people bought a single ticket for this lottery, how many people would win a prize of €10? ______ person(s) out of 1000. 4) In a lottery the chance of winning a car is 1 in 1000. What percentage of tickets will win a car in this lottery? ______ %.
} We refer to this measure as “cognitive ability” in the manuscript.

\section*{4 Behavioral Predictions and Research Hypotheses}

In this section, we elaborate on how we expect the search costs and distinct decision environments to influence the individuals’ choice quality of electricity contracts.

\textbf{Hypothesis 1.} \textit{The fraction of (financially) optimally selected electricity contracts is larger in the “Low Search Cost (LC)” treatment dimension than in the “High Search Cost (HC)”.

Our set-up with the integrated real effort tasks provides a simplistic decision situation in which there are distinct tasks competing for subjects’ attention. By varying the number of alternative contract choices and by keeping the time for solving Task B constant, we expect to observe a lower propensity of optimal contract selection in the HC dimension. This means that when the contract switching task is more demanding, while holding the cognitive resources constant across all treatment conditions by having the exact same Task A, participants’ capacity to choose the optimal contract will decline.
Hypothesis 2. The default contract options are selected more often in Default HC compared to Default LC.

In the HC treatment dimension, where switching costs are higher – and one would have to choose from six alternative contracts instead of four –, we expect the salience of the default assignment (i.e., status quo choice) to be prominent. That is, we hypothesize that subjects are more likely to choose the status-quo (in our set-up: the standard/default electricity contract options) when they are given a larger choice set (Daen et al., 2017). Assuming inattention to be an underlying factor for observing status-quo bias, Daen et al. (2017) show that attention is relatively scarcer in larger decision problems with a greater choice set.

Understanding the consequences of the random assignment for the payoff structures also plays an important role in our set-up. We disclose the information that the default contract is randomly assigned. This means that the expected payoff for remaining passive in the Default LC treatment is higher compared to the Default HC treatment. Given that subjects receive a payoff of 10 cents for each correctly solved Task B, and the randomly-chosen default would be the correct answer in one fourth of the cases in the Default LC treatment, remaining passive would return an expected average payoff of 2.5 cents in each round. In contrast, the expected payoff for remaining passive in the Default HC treatment is slightly lower (about 1.7 cents).

Hypothesis 3. The fraction of (financially) optimally selected electricity contracts is lower in the Default choice setting compared to the Active choice setting.

We expect to observe “default effects” both in Default LC and Default HC treatments, where one of the options is pre-selected as a standard electricity contract. Although the default option is set randomly and participants are instructed about it, we still expect the default assignment to induce “non-switching” to an alternative electricity contract. In line with this argument concerning the persistence of default effects, previous research indicates that interventions aiming to increase the salience of the default assignment are not effective in inducing individuals to switch (Blumenstock et al., 2018). Furthermore, previous evidence suggests that disclosing information about the default option does not affect switching significantly, even when the defaults are unethically chosen (Steffel et al., 2016).

5 Results

As an outcome variable, we analyze the rate of correctly solved instances of Task B for each individual in each treatment condition. This variable measures how often an individual has selected the optimal electricity contract in responding to Task B throughout the experiment, i.e., the choice quality of switching decisions at the individual level.

Result 1. The decision quality for tariff choices remains statistically identical in both LC and HC environments, indicating that the number of alternatives is not the reason for non-switching.

Note that this finding is in contrast with Hypothesis 1. As shown in Figure 1, we cannot reject the null hypothesis that implies that the average rate of correctly selected electricity contracts are identical across the search costs environments. Hence, this finding suggests that the number of alternative contracts, at least within the extent of our experimental variation,
has no statistically significant effect on the quality of the contract choices.\footnote{Obviously, this finding pertains to the specific experimental set-up presented in this study, and thus needs to be interpreted with caution.}

Consequently, our results suggest that choosing from a greater number of alternative contracts is not an underlying cause for observing a high share of non-switchers. Indeed, the selection of the optimal electricity contracts seems to be independent of the number of alternative contracts that individuals are exposed to in the decision environment, which is a very interesting result.

![Figure 1: Average Rate of Correctly Solved Task B](image)

There might be different reasons behind this observation. First, it might be attributable to our experimental design, i.e., our manipulation of the number of contracts might be too small for inducing a substantial change in the level of cognitive resources required to select the optimal contract. Second, subjects might not make deliberate calculations, but instead, compare different options and eliminate irrelevant alternatives. Despite these possible explanations, Task B in the HC treatment dimension should be cognitively more effortful, as subjects had the same time to solve the task, but had to skim through a higher number of alternatives before being able to choose an option. Even if subjects adopted the strategy of eliminating the irrelevant alternatives, this process alone should require additional cognitive resources, compared to the LC environment.

Figure 2 illustrates the average rates of correctly solved Tasks A and B by the subgroups with different cognitive ability measures. We measure cognitive ability following the ‘Berlin Numeracy Test’ explained in Cokely et al. (2012) – a psycho-metrically instrumented test that...
assesses cognitive ability based on statistical numeracy. The figure indicates that subjects’ cognitive ability and their accuracy in solving Task A is positively correlated. Contrary to this observation, the share of optimally selected electricity contracts are distributed uniformly across the treatments, indicating no correlation between the solutions to the task and cognitive efforts needed for solving it.

Thus, Figure 2 implies that the variation in cognitive capacity does not explain the variation in responses to Task B. To understand in how far the cognitive ability test results predict subjects’ electricity contract choices, we explicitly look into rounds where the solution to the task has required an explicit calculation of the different options. In both LC and HC treatment dimensions, there is a single round where the difference in yearly financial costs between the contract options is as little as €1. Hence, in these rounds, the solution to Task B requires participants to deliberately calculate the different options. Indeed, only looking into these rounds, the average cognitive ability test scores of individuals predict, just like in the case of Task A, the average rate of correctly solved answers to Task B. This suggests that participants might mostly have adopted strategies that are different than deliberately calculating each contract option, such as making comparisons or randomly choosing among the alternatives. In fact, 87% of the participants have argued in the post-experimental survey questions that they either

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17This metric provides us with an accurate measure of cognitive ability given that the questions in our experiment involve mathematical calculations together with the electricity tariff selections that can be thought to have an association to financial literacy.
compared different options or have adopted a mixed strategy between calculating and comparing. About 8% of the subjects have mentioned that they only calculated the sum of yearly costs for each contract option. On the contrary, as our experimental design explicitly excludes the use of eye-balling to solve the equations in Task A, 90% of the subjects acknowledged to calculate the sum of each given option in answering Task A. Nevertheless, in order to solve Task B, one needs to do calculations, to some degree, which implies that the task still requires a certain level of cognitive effort.

Figure 3 plots how the average rate of the correctly chosen number of electricity contracts differ between the rounds and treatments.

Figure 3 indicates considerable heterogeneity over the different rounds. Moreover, in the LC treatment dimension the average rate of optimal electricity contracts increase over the experimental rounds, suggesting the presence of learning effects, while visually this is not the case for the HC treatment dimension.

**Result 2.** Assigning a pre-selected default contract option in the decision framework leads to lower decision quality.

Setting a default contract option leads to more suboptimal contract choices on average. This effect remains constant in both the low and the high search cost environments and is statistically significant. The Mann-Whitney-U test reveals a $p$-value of 0.0020 for the difference between

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18Mann-Whitney-U test is a non-parametric test used for examining whether two independent samples are likely to derive from the same population, i.e., the sample distributions have a similar shape.
the Active LC and Default LC. Moreover, the difference between the Active HC and Default HC treatments is also statistically significant at the 1% level (Mann-Whitney-U test, $p = 0.0010$).

Figure 4: Average Rate of Correctly Solved Task B

**Result 3.** Setting a default reduces decision quality more for the group with lower cognitive ability test results.

Figure 4 indicates that the effect of setting a default contract on the choice quality is also consistent across different sub-groups of cognitive ability. This effect remains but becomes smaller for the group with higher cognitive ability test scores. This finding is in line with the conclusion drawn by Altmann et al. (2019). They find that individuals tend to remain passive when facing scarce cognitive resources. Similar to this, in our set-up defaults seem to lower the choice quality of individuals with lower cognitive ability. In other words, defaults seem to harm the decisions of those with lower cognitive ability more.

Figure 5 shows the proportion of individuals that stick to the default assignment in Task B, when the default option is the incorrect and the correct answer to the question. The difference in default adherence between the treatments Default LC and Default HC is not statistically significant (Mann-Whitney-U test, $p = 0.3079$) when the default assignment is the optimal contract choice; however, this difference becomes weakly statistically significant when the default is incorrect (i.e., only at the 10% level). While default adherence is higher in the Default HC treatment when the default is correct, more individuals follow the default in the Default LC when the default is incorrect. This observation conforms to rational decision-making in which sticking to the default option would result in higher monetary losses in the Default HC when...
the default corresponds to a non-optimal electricity contract. That is, the probability that the default is the optimal contract choice is, on average, lower in the Default HC than in the Default LC treatment, as the default is randomly chosen.

![Figure 5: Average Rate of Default Adherence](image)

5.1 Explaining the Tariff Decisions

Figure 1 shows that there is a substantial variation in the average rates of optimally selected electricity tariffs in subjects’ answers to Task B. The variation between the Active and Default treatments is statistically significant, while the number of alternative tariffs does not have a significant influence on the quality of contract choices.

5.1.1 Regression Analysis: Rates of Optimally Selected Tariffs at the Individual Level

To investigate the individual tariff choices in detail, we estimate regression models of the following specification:

\[
\text{Tari}ff \ \text{Rate}_i = \gamma_0 + \beta_1 \text{Cognitive Ability}_i + \beta_2 \text{Switched Tariff}_i + \lambda X_i + \sum_j \delta_j D_j + \epsilon_i, \quad (1)
\]

where the \text{Tari}ff \ \text{Rate}_i \ is the aggregate percentage measure for each individual \( i \) for the optimally selected electricity tariffs in each round. \text{Cognitive Ability}_i \ is the outcome of the cognitive ability
test run at the end of the survey and indicates the percentage of the correctly solved questions for each individual \( i \). \textit{Switched Tariff}_i is a dummy variable for whether an individual has already switched the electricity tariff. \( \lambda X_i \) includes the control variables such as the perceived difficulty of Task A, whether individuals are informed about their monthly or yearly electricity costs in their current electricity tariffs, whether they know which tariff they currently have, and time preferences measured in the post-experimental survey. In Table 3, we report results from the regression models that account for session-fixed effects. Finally, \( \sum_j \delta_j D_j \) is the session-fixed effect and \( \epsilon_i \) is the error term \( \epsilon \sim iid(0,\sigma^2) \).

Table 3: Tariff Choices at the Individual Level

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No. of Observations 78 78 64 64
R-squared 0.249 0.243 0.210 0.229
AIC -74.10 -90.40 -49.40 -62.10
Number of sessions 15 15
Session FE ✓ ✓ ✓ ✓

Notes: The table indicates the estimates from the OLS and linear fixed-effects models for the correctly solved Task B. The dependent variable is an aggregated indicator of the optimally selected electricity tariffs in answering Task B (20 rounds) for each individual. The fixed-effects specifications include session-fixed dummies (coefficients are not reported). Standard errors, clustered at the session level, are in parentheses, ***, **, * indicate statistical significance at the 1%, 5%, 10% level, respectively.

The results from OLS and linear fixed-effects estimations are reported in Table 3. Columns (1)-(2) indicate the specifications for the sample that is reduced to the treatments in the Active decision environment and columns (3)-(4) to the treatments in the Default decision environment. Columns (1) and (3) include results from the OLS estimation, columns (2) and (4) account additionally for session-fixed effects. Yet, as can be seen this does not affect the statistical and economic interpretation of the results.

The evidence is consistent with the results indicated in Figure 1. We find that cognitive

19Even though in each session the main experimenter remained the same person and we have randomized the treatments within each session, the experimental sessions took place on different days over two weeks in August 2019. Hence, similarly as argued in Frechette (2012), we account for session-fixed effects.

20We prefer to have different model specifications for the types of decision environments as the tariff choices are potentially characterized by the distinct differences in this experimental dimension.
ability affects the quality of tariff choices differently in the Active and Default environments. That is, an increase in cognitive ability positively correlates with an increase in decision quality when a default electricity contract is pre-selected in Task B. However, cognitive ability has no statistically significant effect on the tariff choices in the Active decision environments.

Besides this observation, having switched the electricity tariff previously increases the propensity of optimally deciding among alternative electricity tariffs by about 10% when a default contract is pre-selected. This can be attributed to the fact that individuals who have already switched their electricity tariffs are more salient towards the default option. In addition, individuals who have already switched their electricity tariffs might be more cognizant and pay more attention to the default option.

Having switched the electricity tariff before decreases the subjects’ propensity to choose the optimal electricity tariff in responding to Task B by about 5% in the Active decision environments; however, this effect is not statistically significant.

Moreover, time preferences, using the survey question developed by Falk et al. (2018, 2016), explain part of the variation in tariff choices. The group with the strongest time preferences is the omitted category. Having weak time preferences compared to strong ones reduces, on average, the propensity to choose the optimal electricity contract by about 25% in the Active decision environments. This effect is statistically significant at the 1% level. At the outset, this finding seems to be counter-intuitive, as in most of the cases outside an experimental setting the costs and benefits of switching electricity tariffs do not take place at the same time. However, individuals with strong time preferences might be more interested in optimizing their financial outcomes in the experiment. Doing so requires individuals to strategically allocate their cognitive capacity between the two tasks in the experiment. As Task B serves as a distraction from the main Task A, these individuals might purposefully allocate less resources to the contract switching task.

5.1.2 Regression Analysis: Rates of Optimally Selected Tariffs at the Decision Level

Previous regression specifications were based on the aggregated percentage measure for the optimally selected electricity tariffs for each individual over all decision rounds. Here, we investigate the tariff choices for each individual in each period. That is, the dependent variable is a binary measure of whether the individual has selected the financially optimal electricity tariff in each round. We estimate the following equation, again by specifying the tariff choices for the Active and Default decision environments:

\[
\text{Tariff}_{it} = \gamma_0 + \beta_1 \text{Cog. Ability}_i + \beta_2 \text{Switched Tariff}_i + \lambda X_i + \sum_i \omega_i D_i + \sum_t \phi_t D_t + \sum_j \delta_j D_j + \epsilon_{it},
\]  

(2)

where the \(\text{Tariff}_{it}\) is a binary variable that takes the value of 1 if the individual \(i\) has selected the financially optimal electricity tariff in a given round \(t\), and 0 otherwise. Similar to Eq. (1),

\begin{itemize}
  \item The question indicates the following statement: “I am prepared to give up something today in order to benefit more from it in the future,” with a Likert scale from “It is not true at all.” to “It is absolutely correct.” with a consistent scale starting from strong to weak time preferences.
\end{itemize}
we include the same explanatory variables \( \text{Cognitive Ability}_i \) and \( \text{Switched Tariff}_i \), which are measured at the individual level. \( \lambda X_i \) consists of the same set of control variables as in the previous regression specifications. In addition, we include individual, period, and session-fixed effects. \( \sum_i \omega_i D_i \) is the individual, \( \sum_t \phi_t D_t \) the period, and \( \sum_j \delta_j D_j \) the session-fixed effect term.

Columns (1)-(3) in Table 4 report estimation results for the reduced sample on the treatments with the Active decision environments and (4)-(6) on the treatments with the Default decision environments. We document results by estimating Eq. (2) with and without the different fixed-effects specifications. Columns (1) and (4) present results from a linear probability model. Specifications in columns (2) and (5) include period and individual fixed effects. Columns (3) and (6) additionally account for the session-fixed effects.

Similarly to the previous specifications, we find that a 1% increase in cognitive ability test results raises the propensity to choose the optimal electricity contracts in the Default environment by 0.02%, an effect that is statistically significant at the 5% significance level.

Moreover, also in the specifications at the decision level, we find that having already switched the electricity contract increases the probability by about 9% to choose the optimal electricity contract in Task B. This effect is statistically significant for the linear probability model at the 1% and for the specification that includes period and individual fixed effects at the 5% level. However, when we include the session-fixed effects it is no longer statistically significant. That indicates that there are substantial differences between the sessions in subjects’ selection of Task B.

In the analysis at the decision level, we also find that having low time preferences significantly reduces the subjects’ probability to choose the optimal contract in the Active decision environment. Here, too, the group with the strongest time preferences is the omitted category. Our interpretation of this finding considers the details of our experimental set-up. Individuals with low time preferences, i.e., those that place more emphasis on their financial outcomes in the future, likely strategically allocate less cognitive resources to Task B in order to optimize their choices in Task A, as the pay-offs for this experimental task are substantially lower than those of Task A. However, having low time preferences significantly increases the probability to select the optimal contract in the Default environment. At the same time, having low time preferences decreases the salience of the timing differences in experimental outcomes, which by definition is very low, as there is no variation in the timing of paying out individuals in the experimental set-up. Hence, in the Default environment time preferences might have an opposite effect – compared to the Active decision environments – that having low time preferences increases the salience of the default options.
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Notes: The table indicates the estimates from the OLS and linear fixed-effects models for the correctly solved Task B. The dependent variable is an indicator of the optimally selected electricity tariffs in answering Task B for each individual in each round. Different fixed-effects specifications, which include period, individual, and session-fixed dummies (coefficients are not reported) are indicated. Standard errors, clustered at period and individual level, are in parentheses, ***, **, * indicate statistical significance at the 1%, 5%, 10% level, respectively.
6 Conclusion

Despite having a large set of possibilities, consumers tend to stick to their current and/or local electricity providers. These are mostly the standard default providers decided by the regulator for the different regions. Often, the standard electricity provider enjoys a greater share of customers and barely offers highly competitive electricity prices. If consumers do not have strong preferences toward the default provider, then default electricity contracts might result in welfare losses.

Moreover, if consumers benefit from the increasing competition, new entrants would have a better chance to survive in the marketplace by serving a critical number of customers. The increasing competition would result in more efficient market outcomes and might effectively increase social welfare. Hence, when consumers inform themselves about the different tariffs and providers (including the green electricity tariffs, among others) and choose actively, this can foster competition and restrain incumbent providers from exercising monopolistic market power.

In this paper, we have studied both the effect of different choice interventions and the number of alternative contracts on the switching decisions of electricity tariffs. We ran a randomized controlled lab experiment in order to study the two treatment dimensions. Our results show that having a default electricity contract reduces one’s propensity to optimally switch, compared to a setting in which participants are asked to make an active choice. This effect is stronger for the individuals who have demonstrated to have lower levels of cognitive ability. That is, the default harms the individuals with limited cognitive ability more. Moreover, we find that the number of alternative contracts does not hamper decision quality. This suggests that high search costs might not be the main underlying reason for observing a high rate of non-switchers, whereas implementing default contracts is.

Our experimental findings indicate that individuals decide better when confronted with the possible alternatives, rather than automatically allocated to a default plan. Hence, allocation of standard tariffs by the default electricity providers can be challenged by implementing a simple rule of asking for consumer consent. If there is a rule to remind/inform consumers about the possible electricity tariffs and providers, rather than automatically allocating them to a standard provider, they might also undertake more effort in actively finding the available options that are in their interests and also in line with their preferences.

Finally, our experimental design and findings are subject to a number of limitations. To start with, our experimental sample is not representative; however, based on previous research, it is reasonable to think that our findings would be reproducible if the participants were not student subjects. Thus, our findings need to be interpreted with caution – and as a first attempt towards understanding the experimentally specified underlying mechanisms of passive electricity contract choices.

While a lab experiment grants us a highly controlled environment for examining the specific research questions we address, an important direction for future research would be to study active and passive electricity contract choices also in the field.
References


Appendix A: Instructions (Translated from German)

Instructions

Welcome to this computer-aided decision experiment. Please read the instructions carefully. After entering the laboratory, please do not communicate with the other participants. If one or more participants communicate with each other, the session will end. If you have any questions before or during the experiment, please contact us by raising your hand and the experimentator will come to you to help.

The Experiment:

The experiment consists of a total of 20 rounds. In each round you can work on two different tasks. The order of events in each round is as follows:

- Task 1 shows three calculations for 40 seconds.

![Task 1: In all treatments]

- In Task 1, you should calculate the sum of the numbers in each of the three rows and remember the result.

- After this task, the calculations are hidden for 40 seconds. During this time you can (but do not have to) work on Task 2. [Only in Baseline LC and Baseline HC] To work on this second task, you must enter the number shown on the screen.

- Task 2 shows six different electricity contracts, each with three components: Electricity price per kWh consumption [€/ct/kWh], the monthly electricity bill [€/mth] (your electricity consumption is assumed to be 5100 kWh per year) and the one-time bonus payment for concluding the contract [€].
[Task 1: Only in Baseline LC and Baseline HC]

- [Only in Default LC and Default HC] One of the four [Default LC] / six [Default HC] contracts is randomly selected in each round. If you are not working on the task, this option is considered your choice. The selected contract will be determined randomly. This means that in about one-fourth [Default LC] / one-sixth [Default HC] of the cases, the selected contract is also the contract with the lowest annual electricity costs.

- You should find the contract variant that contains the lowest annual electricity costs.

[Task 2: Only in Baseline LC and Active LC]
[Task 2: Only in Baseline HC and Active HC]

[Task 2: Only in Default LC]
• After 40 seconds, a screen with three input fields appears. In these fields, you can enter the numbers that you memorized in Task 1. You have 15 seconds to enter the numbers in the respective input fields.

[Task 1: In all treatments]

• Only if you enter all three numbers from the first task correctly and press the “Confirm” button, you will receive a payoff of 50 Cent for this task. If you do not solve one or more calculations correctly you will get 0 Cent.

• If the electricity contract you selected has the lowest annual electricity costs in the second task, you will receive a payoff of 10 Cent. If the electricity contract you selected does not have the lowest annual electricity costs, you will receive 0 Cent.
• The total payoff in a round corresponds to the sum of the payoffs from both tasks.

• In addition, you will receive a show-up fee of €6.

To show that you have read and understood the instructions, please place the sheet in front of you on the table. The experiment will begin shortly. Please remember that no communication is allowed during the experiment. If you have any difficulties, please contact us by hand signal. The experimenter will then come to you and help you.

Before the experiment begins, you will be given a practice round explaining the order of the tasks in each round.

Thank you very much.
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