Research Proposal

Switching in the Danish Electricity Retail Market

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1 Motivation and Research Question

With the recent market liberalization, the Danish electricity retail market is *theoretically* highly competitive, with more than 40 suppliers selling a relatively homogenous product. In this type of market, rational consumers should switch to the electricity provider with the lowest costs. To date, there is no evidence that this is the case. On the contrary, reports from the Council of European Energy Regulators and the Danish Utility Regulator suggest that only approximately 5 percent of households switch electricity providers in a given year and that the Danish consumers are losing between 60 to 2030 DKK per household per year by not switching (Council of European Energy Regulators, 2019, Forsyningstilsynet. 2020). The estimates are, however, only rough back-of-the-envelope estimations of switching behavior and possible savings and do not take into account the heterogeneity of the consumers in the market.

From a policy perspective, it is crucial to understand the extent and the distribution of consumer inaction in the Danish electricity market. Are we mostly observing rational choices in a well-functioning market (i.e., consumers making fully informed decisions about switching and deciding that the savings are not worth the effort)? Or is the widespread inaction a result of misinformation, market frictions, or psychological barriers? In the first case, policy involvement is not necessary from a consumer welfare point of view.[1] In the latter case, for which there is extensive evidence in countries such as the US, UK, Australia, and Japan, targeted policy interventions could help consumers overcome these barriers and make better consumption choices (Deller et al. 2021; Hortaçsu, Madanizadeh, and Puller 2017). Understanding the distribution of consumer inaction is critical since international evidence suggests that low socio-economic households are less likely to realize savings by switching, which means that market inefficiencies could even exacerbate economic inequality (Hortaçsu, Madanizadeh and Puller 2017).

This project will answer whether there is a cost savings potential for consumers in the Danish electricity market and for whom and which types of consumers realize these savings by switching.

Since 2020, all Danish households are equipped with smart meters allowing for detailed consumption behavior and choice of energy supplier. Our empirical approach will exploit this novel data source at Statistics Denmark, which has never been used to investigate consumer behavior. We will combine this data with demographic and housing data from the Danish registers, price data from Forsyningstilsynet, as well as a representative survey data for a subset of the population to validate the supplier data and the price data.

Our project is the first but crucial step in understanding switching in the Danish electricity market. We will i) provide a comprehensive estimation of the potential savings that are not realized in the Danish electricity market and ii) classify consumer types based on their consumption and switching behavior and estimate whether cost savings matter for switching decisions

Given that the proposed project would be the first to investigate switching in a complete market (the full population with all suppliers), we think the project has high publication potential in the economic literature.

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[1] Policy could be relevant from a demand management perspective to move people from fixed to flexible pricing. However, even in that case it policy makers need to know whether consumers are responding rationally to price changes.

2 Method and Data Strategy

Our method relies on a combination of electricity contract data obtained from Forsyningstilsynet, smart-meter data from Statistics Denmark, registry data from Statistics Denmark, and a survey to validate the potential savings of household types. The data we will use from the registries are the following: Housing data from the building and housing registry, demographic data from the citizen, income, family income, education, and labor market classification registries, and data on electric vehicle ownership from the Danish car registry. We will combine this data with household-level data on the electricity provider and hourly electricity consumption, which is transferred directly from the Datahub (Energinet) to Statistics Denmark. The electricity data is merged with the housing data and from there coupled with demographics on households. The roll-out of smart meters was finished by the end of 2020. However, 2 million households had a smart meter already in August 2019, so we will focus on the data from January 2020-June 2021, where most households should have available data.

Step 1: With the above data, we will construct a panel data set on the monthly level. We can 1) show the (regional) distribution of the market share of electricity providers 2) estimate the total switching among the population during the period based on region and household characteristics, and 3) classify individuals into different consumer levels to identify consumers with particularly high energy consumption who might benefit most from switching contracts (for example owning an electric vehicle).

Step 2: Next, we will combine this data with price data from Forsyningstilsynet. This combination will allow us to estimate the price paid per kWh for every household and to estimate the counterfactual price at the lowest competitor, thus allowing us to estimate the maximum savings for each household. One drawback of the data is that we cannot see the exact contract the individuals have with their provider (this would require customer data from every electricity provider in Denmark, which is currently not feasible). Some providers only have one plan. For the others, we have two approaches to solve this. First, by approximation. For each provider, we know the price plans that are offered and can estimate averages.

Step 3: Second, we plan to conduct a representative survey with a subset of the population to validate our estimates. We will ask consumers about their type of electricity contract (flexible or fixed) and how much they pay. In addition to validating our price estimates, the survey also gives us information on the awareness in the population about their energy costs and contract types and thus provides a basis for future work on barriers to switching, given that we find that there are significant savings to be realized for consumers. We plan to send out 60,000 survey invitations and expect ca. 12,000 responses.

Step 4: For modeling the switching decision, we create a predictive model using potential savings as our main explanatory variable. Using the framework developed by Hortaçsu et al. (2017), we base our estimation on a two-stage model, where we simultaneously model the decision to consider switching and the decision to switch. In practice, this is done using a Generalized Method of Moments (GMM) estimation technique. Using consumer characteristics and energy costs, the first step models the decision to switch, and the second step models the subsequent choice of retailer.

Potential: Given the novelty of the household-level data, the possibility to estimate switching for the whole market, and combining the register data with survey evidence, we anticipate publishing the results in a top field journal such as AEJ:Public Policy or Journal of Public Economics. Furthermore, the project will provide direct input for policymaking by a detailed mapping of the Danish electricity market (a desired outcome as evidenced by the support letter by Forsyningstilsynet attached to this application).

3 Feasibility, Timing, and Budget

Ida Damsgaard is a guest researcher at Statistics Denmark and already has access to the registry data. The price data will be provided by Forsyningstilsynet. Through the affiliation of Christina Gravert with CEBI, we have the possibility to collect survey data through the online digital mailbox, e-Boks, which makes it possible to target a random representative sample of Danish households. Linking survey data with registry data is feasible, as evidenced by several similar projects conducted by CEBI researchers (Kreiner et al., 2015).

The work on the register data for this project will begin in June 2021. We expect the data matching and first step analysis to require four months of full-time work by Ida Damsgaard until October 2021. Christina Gravert will start working on the survey design and implementation in August 2021. In September 2021, we plan to send out the survey. The data will be matched in October 2021, and further analysis work will be carried out at the end of the year. Writing the paper will take another four months until May 2022, at which point we plan to have a working paper published.

We plan to send out 60,000 survey invitations, which, based on experience, should result in ca 12,000 respondents. We will incentivize participation with 100 gift cards with a value of 500 DKK each. We estimate three months of full-time work for Christina Gravert. Ida Damsgaard is fully financed through her Industrial Ph.D. position. We estimate four months of part-time work for a research assistant to help with the contract price data and survey programming and monitoring of questions from participants. We plan to present the working paper at three relevant academic conferences.

4 Project Participants

Christina Gravert is a tenure-track assistant professor at the University of Copenhagen and affiliated with the Center for Economic Behavior and Inequality. She completed her PhD in 2014 at Aarhus University. Christina has been the project leader on several research studies investigating barriers to behavior change and developing policies. She has designed and carried out several large-scale field experiments and surveys that have been published in relevant economic journals, such as Journal of Public Economics, Journal of Economic Behavior and Organisation, Review of Environmental Economic and Policy and Behavioral Public Policy.

Ida Damsgaard is a Ph.D. student at the Copenhagen Business School and is affiliated with the Copenhagen School of Energy Infrastructure. Ida holds a Master of Science (MSc) in Economics from the University of Copenhagen and has a strong skill set, particularly regarding microeconomics and econometrical analyses. Ida has experience working with Danish registry data and has extensive knowledge about the Danish energy market through her policy consulting work.

References

Council of European Energy Regulators. 2019. *Monitoring Report on the Performance of European Retail Markets in 2018*. Brussels, Belgium.

Deller, David et al. 2021. 'Switching Energy Suppliers: It's Not All About the Money'. *The Energy Journal* 42(3).

Forsyningstilsynet. 2020. *Hvad kostede strømmen i 2019? Prisundersøgelse af elprodukter til private og mindre virksomheder*.

Hortaçsu, Ali, Seyed Ali Madanizadeh, and Steven L. Puller. 2017. 'Power to Choose? An Analysis of Consumer Inertia in the Residential Electricity Market'. *economic policy* 9(4): 192–226.

Kaiser, Micha, Manuela Bernauer, Cass R. Sunstein, and Lucia A. Reisch. 2020. 'The Power of Green Defaults: The Impact of Regional Variation of Opt-out Tariffs on Green Energy Demand in Germany'. *Ecological Economics* 174: 106685.

Kreiner, C.T., Lassen, D.D. and Leth-Petersen, S., 2015. 10. Measuring the Accuracy of Survey Responses Using Administrative Register Data (pp. 289-307). University of Chicago Press.

Ndebele, Tom, Dan Marsh, and Riccardo Scarpa. 2019. 'Consumer Switching in Retail Electricity Markets: Is Price All That Matters?' *Energy Economics* 83: 88–103.