**ELECTRICITY BLACKOUTS FOR BUSINESS CONSUMERS: PERCEIVED IMPACTS, HETEROGENEOUS RESPONSES, AND THE ROLE OF COGNITIVE DRIVERS**

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## Overview

**Within the broad and on-going debate concerning the value of security of supply in electricity (5, 7, 14), a stream of the literature devoted to demand-side analyses has investigated the perspective of business consumers, with the aim of assessing the magnitude and kind of damage that blackouts with different characteristics may cause to firms with different consumption patterns. Most of the analyses conducted on this topic rely on three kinds of methods. The first and most widely used one is the production function approach: these studies approximate the cost of a blackout with the so-called “value of lost load”, namely the ratio between the gross value added and the electricity consumption for each economic sector (5, 12, 13). The second one is the analysis of stated or revealed preferences: this kind of studies exploit either ad hoc surveys, or market data concerning the purchase of back-up devices or the enrolment into interruptible supply programmes to infer the value that business consumers place on security (2, 3, 4, 6, 8). Finally, a third group of studies, usually targeting lower income countries, relies on the econometric analysis of cross-section or panel data concerning the performance of firms and the occurrence of blackouts within a given region to estimate the loss of productivity or turnover determined by blackouts over one or more years (1).**

**My analysis contributes to this debate by proposing a stated preference study for the case of Switzerland. More in detail, I focus on the value of security for business electricity consumers and study: a) the kind and magnitude of damage that blackouts may cause to business consumers, b) the willingness-to-accept of business consumers for blackouts with variable duration and with or without advance notice, c) the magnitude and drivers of heterogeneity in the preferences of business consumers with respect to blackouts.**

## Methods

I explore the value of security by investigating stated preferences data collected by means of an original survey distributed among 543 firms located in Canton Ticino, Switzerland, between December 2018 and January 2019. The sample covers all economics sectors and firm sizes, and is reasonably representative of the economy of the region. The survey included questions regarding the firm’s size, activity, and electricity consumption pattern, questions concerning the magnitude and kind of damage suffered in the event of a blackout, and finally a discrete choice experiment where each respondent was asked to repeatedly choose one out of two blackout scenarios differing in blackout length, advance notice, and possible compensation expressed as a percentage of the monthly electricity bill.

The discrete choice model is set up as a profit maximization problem: its mathematical structure resembles the typical random utility framework for individual decision making, but applies it to a firm’s setting (3).

## Results

The estimated models suggest that the willingness-to-accept for an increase in blackout length is positive, but decreasing with blackout length; the respondents require moreover a substantial compensation for giving up the advance blackout notice. The results suggest however that while 61% of the respondents take all blackout characteristics into consideration, the remaining 39% have lexicographic preferences, i.e. systematically choose the alternative with the shortest blackout duration and disregard the availability of advance blackout notice and monetary blackout compensation. A probit regression connects the probability of observing lexicographic preferences to less frequent blackout experiences and a lower awareness about the own electricity bill. These results can be interpreted in light of literature concerning the use of heuristic decision making in discrete choice modelling (9, 10, 11). Indeed, the fact that 39% of the respondents resort to a lexicographic approach in the evaluation of the alternative blackout scenarios might be seen either as a proper reflection of their actual preferences, or as a consequence of respondents’ fatigue or a heuristic approach to this specific discrete choice experiment. In the former case, these businesses can be seen as placing an extremely high importance on avoiding blackouts or reducing their length, irrespective of the availability of advance notice or compensations in the electricity bill. In the latter case the preferences of the non-lexicographic respondents can be regarded as the best available information on the preferences of profit maximizing business consumers in general. By disentangling the heterogeneity associated to the use of a different decision rule from that intrinsic to consumer preferences, I provide a better representation of the reactions of business consumers when confronted with blackouts, and contribute to the identification of market segments placing a different value on security (3).

## Conclusions

Electricity is a homogeneous good, indispensable for production activities, but often absorbing a relatively small fraction of the monthly budget for business consumers. Nonetheless, my results suggest that preferences with respect to the reliability of supply show a sizeable heterogeneity, and are heavily impacted by demographic and cognitive drivers. Business consumers have, indeed, heterogeneous preferences with respect to blackouts, depending not only on their own consumption patterns and previous blackout experiences, but also on the cognitive processes that interfere with their reactions when evaluating a blackout scenario. Despite being based on a hypothetical setting, my contribution provides useful hints on the trends emerging in consumer behaviour with respect to the challenges brought about by the energy transition, and the technologies enabling demand response or a customized level of security. Albeit centred on the case of Switzerland, these results can be extended with minor adjustments to similar high income countries engaged in the energy transition, as they highlight the importance of correctly dealing with heterogeneity in consumer behaviour and investigating its determinants.

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