THE FRONTRUNNER, THE LAGGARD, AND THE UNDECIDED: PROFILING EARLY AND LATE ELECTRIFIERS

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Overview

Household-level appliances that allow a higher penetration of renewable electricity are a key pillar of a successful energy transition. Indeed, green devices such as rooftop photovoltaic panels, heat pumps, electric vehicles, and batteries allow a fast decarbonization of both households' electricity consumption, and energy demand for transport, and space heating and cooling. Understanding households' purchase decisions in this respect has thus become increasingly important, and indeed, in the past decade several researchers have investigated the role of observable and unobservable drivers in shaping individual decisions. There is therefore a vast empirical literature concerning the impact of technical factors, prices, budget constraints, but also demographic variables, habits, energy literacy, and individual attitudes, such as environmental concern.

As these technologies become more advanced and more popular, however, their producers and retailers are turning their interest into selling bundles of green devices, instead of individual items - photovoltaic panels and a battery, photovoltaic panels and heat pumps, or any other combination that may be attractive to both new customers, and customers who want to expand their green appliances. On the other hand, households that already own one or more of these devices may consider investing in an additional device, and households that are new to this market may consider purchasing more devices at the same time, or in a particular order. The drivers that may influence purchase decisions for more than one green device may be different as compared to those relevant to each individual device. Technical constraints, for example, may impose an additional limitation next to budget constraints. Technological affinity may play a role next to other attitudinal variables, and may in turn be influenced by the experience with other green devices previously purchased by the individual. The evidence concerning the purchase drivers for bundles of green devices and the decision-making process in this very specific circumstance is however rather limited, with only a few empirical analyses conducted so far.

Our contribution aims at addressing this knowledge gap by means of an empirical investigation of the profile of early and late electrifiers, i.e. individuals that are more, or less, likely to own more then one green device. We also shed light on the behaviour of undecided individuals, i.e. those who are either not fully convinced of purchasing these devices, or at a very early stage of the decision process.

Methods

We exploit original survey data collected among a sample of 5'151 residents of Canton Ticino, one of the Italian-speaking regions of Switzerland, between November 2022 and February 2023.

The survey was developed in cooperation with the the Institute for the Management of Renewable Energies (IWOE) of the University of St Gallen (Switzerland), that has been running regular inquiries on the attitudes toward renewable energies among German- and French-speaking residents of Switzerland for 11 consecutive years. The questions covered the ownership of each of the four devices (rooftop photovoltaic panels, heat pumps, electric vehicles, and batteries), a number of demographic and behavioural characteristics of the respondent, and finally the respondent's opinions on some topics related to Swiss energy and climate policies that were very much debated in the media when the analysis was conducted. The panel for Ticino was recruited through seven local electricity suppliers, that kindly submitted the invitation to fill-in our on-line survey to their customers. As an incentive, we offered a monetary prize of 500 CHF (~500 EUR) to one randomly selected respondent.

The econometric analysis we develop is based on a discrete choice model. Indeed, the survey does not include a proper discrete choice experiment, but rather investigates the ownership of each green device by asking the respondents to state if the already own it, if they plan to buy it soon, if they didn't think about it yet, or if they decided not to buy it. We consider the four "ownership answers" as our alternatives, and use a cross-nested logit structure to assess the factors that influence the probability of choosing one of these answers for each individual device. Moreover, we exploit the technique used to combine stated and revealed preferences in order to develop a single discrete choice model comprising all the four devices at the same time.

This econometric structure allows us to model the likelihood of owning the four devices. The use of a cross-nested logit allows us to estimate if each of the possible ownership answers is more or less similar to the others, and thus to evaluate the likelihood that undecided individuals actually buy the selected appliances, by measuring if the intermediate answers are closer to "Yes, I already own this device" or to "No, I decided not to buy it". This model also allows us to assess the role of demographic, behavioural, and attitudinal variables in determining the individuals' purchase behaviour, and investigate whether these drivers exert a comparable impact on the purchase decisions for all the four drivers, or rather play different roles for each device.

Results

Our preliminary results show the existence of three nests in the ownership anwers: one comprising "Yes, I already own this device" and "No, but I consider buying it soon", one comprising "No, but I consider buying it soon" and "No, I didn't think about it yet", and finally one with only one alternative, that is, "No, I decided not to buy it". This suggests that among the undecided individuals, some are actually considering the purchase with a higher likelihood as compared to their peers, but all have a radically different stance as compared to the individuals who deliberately opted out of the market for these green devices.

When considering the drivers that may make an individual more or less likely to be a frontrunner rather than a laggard, our preliminary results show that respondents living in families with at least 3 members are significantly more likely than singles or couples to adopt these technologies, and the same holds for university graduates as compared to respondents with lower educational attainments, as well as and respondents living in a detatched house as compared to those living in a multi-family building. Other drivers play a different role for each technology: for example, older people are less likely to purchase these devices, but the effect of age is two to three times higher for electric vehicles as compared to other devices. Gender plays no role in the purchase of batteries, but it affects purchase decisions for electric vehicles and, to a much lower extent, heat pumps and photovoltaic panels. The frequent use of public transport is also associated to a lower probability of buying an electric vehicle. The desire to contribute to climate protection is a strong purchase driver for all drivers except batteries, whereas the interest in economic savings is strongly correlated to a lower probability of purchasing a heat pump, and the interest in self-sufficiency is associated to a higher probability of purchasing heat pumps and batteries.

Conclusions

Progress in the energy transition increasingly requires a holistic approach to decarbonization. This means that both policy makers, and businesses need to consider on the one hand the interactions across previously independent energy consumption segments, on the other hand the preferences, perceptions, and attitudes of non-technical actors that are increasingly engaged as co-creators of the transition process.

Understanding the processes and factors that lie behind households purchase decisions is thus very useful for a wide number of stakeholders, particularly in a setting where electrification devices and devices for the production of renewable electricity are increasingly accessible and easy to combine. Our results may provide useful inputs to improve the policies aimed at favouring the adoption of green devices, the commercial strategies used to attract new prospective buyers with or without previous access to these green devices, and finally the design of each device per se, in order to make each device more suitable for the characteristics of each households and easier to use in combination with the other devices.