

Arijit Sen, University of Maryland, School of Public Policy

Title: Classification of Household Behavior in Ownership and Usage of Energy Efficient Appliances and Analysis of Relationship of Household Classes with Socioeconomic Variables and Consumption

Abstract: Energy efficiency outcomes for residential consumers depend on not only on the fact they own energy-efficient appliances but also on how effectively they use appliances that account for a significant share of the electricity bill, such as air conditioning and heating equipment. Classification of households on the basis of both their ownership of energy efficient appliances and their strategies in maintain ambient temperature through air conditioning and heating equipment is essential for policymakers and utilities to identify consumers who might be proficient in terms of one parameter of being an energy efficient household but might not in the case of others, highly proficient across multiple parameters, or somewhere in between. The U.S. Energy Information Administration (EIA)'s nationally representative household survey database with over 5,000 sampled households, the 2015 Residential Energy Consumption Survey (RECS) was used for this purpose. The database has information on the ownership of energy efficient appliances such as washing machine, dryers, dishwashers, refrigerators, and water heaters as well as the household level temperature control strategy of air conditioning and heating equipment - no control, manual control, single temperature, or programmable thermostat usage. These variables are used to create distinct clusters of households using the K-Modes clustering and RObust clustering using linKs (ROCKS) algorithms accounting for categorical nature of variables. Preliminary results indicate that there are distinct clusters of households who do tend to own a number of energy efficient appliances but vary significantly in terms of temperature control strategy with a vast majority of households preferring to control temperature manually or set their thermostat to a single temperature. Multinomial logistic regression analysis of the clusters against a range of socioeconomic variables suggest that factors such as education, income, and home ownership are strongly associated with the cluster of households that use programmable thermostats to control temperature over households that use other strategies. The clusters and the socioeconomic variables are also analyzed in conjunction with household electricity consumption to determine their combined effect of consumption using linear mediation analysis, demonstrating that heavy electricity consumers tend to engage in more energy efficient behaviors, although without panel data it is difficult to determine causality in any direction.