

Household size and composition as a driver of energy poverty: Evidence from census data in non-OECD countries

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Extended abstract

1. Description of topic and theoretical focus

Access to electricity is a prerequisite for a number of activities that significantly raise the quality of life and prevent poverty (Pachauri & Spreng, 2003). Although electricity network has expanded rapidly in many developing countries making access to electricity universal in some places, almost 20% of the world population does not yet have the access to electricity (Panos et al., 2016).

Demographic changes play an important role in electrification success. For example, rapid population growth in Sub-Saharan Africa slowed down or even reversed improvements in electricity access measured by share of people with access to electricity (Pachauri et al., 2012). Also, changes in household formation and type could result in significant increase in demand for new connections. Developing countries are characterized mainly by young age structure. Changes in the household formation towards increased preference for nuclear families or leaving parental household in general creates a great demand for new connections to the electrical grid as shown in South Africa (Wittenberg et al., 2017). Evidence from developed countries shows increased residential electricity consumption for younger (Liddle, 2011) and older cohorts (Estiri & Zagheni, 2019; Liddle, 2011). The same is not yet confirmed for developing countries, but due to their young population structure it could prove to be another obstacle in gaining universal electricity access.

In the research on residential energy consumption emphasis is put on building characteristics. Yet, building characteristics alone did not explain the household energy consumption. Broader understanding of household energy consumption lacks demographic background because existing research connecting these topics show that households have an indirect impact on energy consumption (Estiri, 2015; Estiri & Zagheni, 2019).

Access to electricity is a prerequisite to electricity consumption and we argue that some concepts valid for energy consumption apply to access to electricity. However, energy consumption represents the “demand-side” yet access to electricity represents the “supply side” since it depends on infrastructural projects funded by national authorities or large-scale private investments. In the case of developing countries, the access to electricity is rather an issue of infrastructural development, not the household choice. Therefore, in our research the framework of access to electricity is based on the concepts of energy inequality or energy poverty.

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Energy inequality is well represented in existing literature. The concept of energy poverty and human interaction measured through demographic processes is still lacking the broad empirical evidence (Pachauri & Spreng, 2003, 2011). On the contrary, the effect of demographic change (mostly ageing) on energy consumption in developed countries is well covered. Issues present in developing countries like rapid urbanization, change in household size and structure and population growth are lacking research that connects them to consumption or more specific sub-types like energy consumption. Our aim is to widen existing knowledge on energy poverty from the demographic perspective. Rapid urbanization in developing countries led to new issues regarding urban infrastructure, most commonly viewed through inadequate access to services and slum formation (Ooi & Phua, 2007). In our research, we want to show whether urban status affects the household's odds of being electrified or not. Due to changes in household formation, we want to observe the effect of household type on household's access to electricity.

2. Data and research methods

We used census microdata from The Integrated Public Use Microdata Series-International (IPUMS-International) project. IPUMS-I data consists of integrated and harmonized census microdata that allow crosstemporal and cross-sectional comparability (Sobek et al., 2011).

Our dataset consists of 228 different samples from 75 non-OECD countries represented in IPUMS-I project from the period 1970-2014. We used harmonized set of variables and used provided person and household weights in our analysis.

Our primary variable of interest was variable "ELECTRIC" which indicates whether the household had access to electricity. Since our aim was to identify the key aspects of access to electricity regarding urban status and household type we focused only on private households. Also, we focused on urban status of settlement in which household was located (variable "URBAN").

Since access to electricity is a household-level variable, we were limited in studying the effects of individual-level sociodemographic variables on access to electricity such as age, sex and education. In comparable research on consumption one could mitigate this issue by studying single households (Raty & Carlsson-Kanyama, 2009). In that case, all individual-level variables apply to the household-level and *vice versa*. However, this approach has its own caveats and limitations and cannot be considered as a fully adequate method for understanding the effect of age, sex and education and other individual-level characteristics on access to services.

Using binomial logistic regression, we fitted models for every country with household's access to electricity as a dependent variable. Predictor variables were various household characteristics with an emphasis on household size and composition. In the case of single households, more individual level variables were used as a predictor variables.

3. Expected findings

Although we included all available non-OECD countries, we focus our discussion on those countries with lower levels of electricity access and those with pronounced inequalities. We expect to further support our preliminary results that show bigger, rural and extended family households are correlated with lower chance of access to electricity. Further analysis should support our

preliminary findings that regional differences exist. Most notably, that is the case of Sub-Saharan Africa. For Example, Latin America and majority of Asian countries had relatively high aggregate share of households with access to electricity, effectively leaving the energy exclusion to the small group of households usually in rural areas. On the contrary, some Sub-Saharan countries showed low electrification levels even in urban areas. We expect to show that household characteristics are more important in countries (or regions) with lower levels of electricity access and urban-rural status in countries with higher levels of electricity access.

Our research demonstrates that IPUMS-I data can be used to analyze inequality or access to services on a large-scale. We stress out that this analysis should be taken with caution regarding the temporal aspect since improvements in electrification in recent decades had a rapid pace in some parts of the world. This is best illustrated through impressive improvement in Latin America. Latest data shows that just a few countries in Latin America do not have universal access to electricity (World Bank, 2021). This is a limitation of our research. However, our results on energy inequality based on household characteristics magnify the necessity for research on demographic aspects of ongoing and future energy policies.

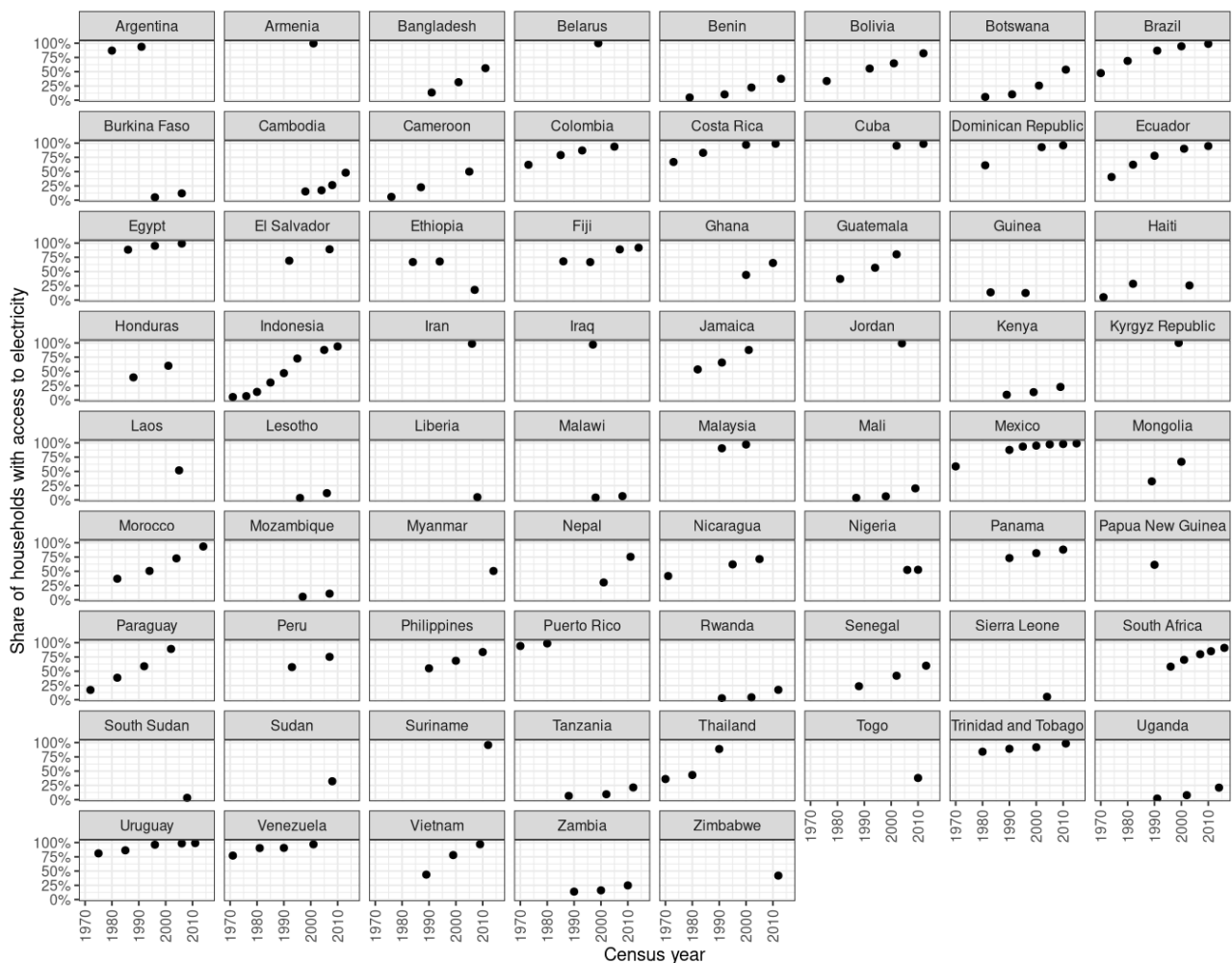


Figure 1. Share of households with access to electricity

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