ACCESS TO ELECTRICITY IN SUB-SAHARAN AFRICA: THE REGRESSIVE EFFECT OF TARIFF STRUCTURES ON URBAN AND RURAL ON-GRID HOUSEHOLDS

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Overview

In sub-Saharan Africa (SSA), the energy access gap between urban and rural populations remains considerable, even among households and businesses with potential access to the grid. In this context, tariff structures are the interface between the conditions for producing electricity, the end user and public energy-access policy. This article evaluates the contribution of electricity tariff structures, as a major access instrument, to the continued existence of the energy access gap, and looks at whether this gap is primarily between rural and urban populations. Using a dynamic panel with random effects model, the article shows the systematically regressive effect of electricity pricing on access for both residential and non-residential consumption. We find the electricity pricing fails to provide reduced rates to enable access to the poor, neglects households passing the threshold of the first consumption block and is ineffective at addressing energy poverty in urban and rural households. For households with access to a centralised power grid, we find that the criterion of location is less important than the economic conditions of the customers served.

Methods

Using data gathered from the regulatory commissions of 33 SSA countries, we analyse electricity access to urban and rural households connected to the power grid through a panel-data model with random effects. Data is organized as follows : For the period of 1990-2012; Using 17 independent variables, divided into three categories: i) tariff structures for residential and non-residential consumers, ii) production types, iii) willingness to pay in each household income quintile. Given the diversity of the countries studied, the database is divided into four groups of countries, created by combining energy poverty rate with access rate. To ensure the results are comparable, the highest-ranking group, with the highest electrification rate and the lowest energy poverty, is used as the benchmark. The research question was answered using a dynamic panel. The specification of individual effects led us to choose a random effect model (Hausman test).

Results

To compare the determinants of access among sub-groups, we use Group 1 (countries with high rate of access to electricity, low energy poverty) as a benchmark. The overall results highlight the regressive nature of tariff schedules, which in turn work against access to electricity. The results of the model detail the operation of this self-sustaining and widespread mechanism of energy poverty and access as well as location and access.

Tariff structure dimension

Residential pricing creates a sharp divide between the groups of countries. When there is low energy poverty (groups 1 and 2), this pricing lets urban households finance rural access through cross-subsidised financing and thus contribute to the expansion of rural electrification. These tariffs, including the lifeline rates, are robust. On the other hand, in countries with high energy poverty (groups 3 and 4), pricing favours urban access at the expense of rural access. Lifeline rates are unable to counter this reversal, even though a certain level of electrification provides eligible rural households with modest access

The tariff structures for industry and commerce point to a trend of favouring industrial activities in the countries concerned. Thus, for group 1, electricity pricing has promoted the growth of urban industry, which has benefited from a transfer from commercial activities, while they have promoted both commerce and industry in rural areas. South Africa's virtuous trajectory remains very specific. Mining industries, which are representative of the group 2 (Angola, Nigeria, Uganda, Zambia), are clearly favoured by the tariff strucutures at the expense of the commercial sector. These significant results are nevertheless only useful for urban access. In rural areas, tariff structures work against both industrial and commercial activities. In contrast, in groups 3 and 4, tariff structures work against urban industry with no consistent benefit for commercial activities. Rural industry is not supported by the tariff structures in effect, and the results for commercial activity are ambiguous. When the development level allows for it, electricity pricing supports industry, which is the biggest creator of value.

The production dimension

For all the country groups, the production variables have a very weak explanatory power for access. The public utilities' ineffectiveness in serving urban and rural customers can be found almost everywhere. The deregulation of suppliers through IPPs, does not counterbalance this ineffectiveness except in the countries of group 1. These results once again confirm the deficiencies of the centralised electricity supply in promoting rural electrification.

The willingness-to-pay dimension

Willingness to pay make it possible to attribute a monetary value to the increase in welfare explained by access. Here, the results make it possible to specify the adverse contribution to access to social tariffs in the tariff structures implemented. Only the urban households in the first quintile of country groups 1 and 2 have a positive WTP directly linked with their access to lifeline rates, which acts as a learning effect. In the same two country groups, the negative WTP in the second quintile shows that residential pricing is too high for these consumers to consider buying electricity without aid, but their income level is too high for them to access the lifeline rate. In these same two groups, which have the lowest energy poverty rate, the second income quintile in urban areas thus falls into a sort of black hole in terms of access. In urban households in groups 3 and 4, as for all rural households in the other groups, WTP is negative for the first quintile, and the subsidised rates are powerless to trigger access. Household income level is indeed the major obstacle to access, and lifeline rates contribute little if at all in countering this situation. With the exception of urban households in the second quintile, all households, urban or rural, have a positive WTP. This result is not supported, at first glance, by the access permitted by lifeline rates (except for rural households in groups 2 and 3). This means that residential pricing also misses its target in this case. For households with income levels in quintile 3 and over, the results are contradictory. WTP is positive or negative without any obvious pattern. The prevalence of positive WTP in rural areas still should be noted: there are indeed households in a position to pay for both access to the grid and electricity but are deprived of both. It should also be noted that the negative WTP of the highest income quintile in urban areas of countries with a high electrification rate almost certainly indicates a need for service quality improvements, especially in reducing power outages. In contrast, a positive WTP in an urban area at the same income level, but in a group 4 country with a low electrification rate, indicates a population with the ability to pay but most likely not yet connected to the grid. In the end, it is the economic conditions of different population groups, more than their location, that limit or promote access to electricity. Residential pricing that is not sufficiently segmented in urban areas has questionable effects. Focusing on pricing that helps the poorest to gain access, when this is successful, reveals new targets that are completely ignored by current tariffs. This analysis of willingness to pay makes a case for a more dynamic approach to residential tariffs that is attentive to the shifts in the thresholds of energy poverty.

Conclusions

The ineffectiveness of the tariff structures developed by power companies provides an important piece of the explanation why there is still a massive lack of electricity access. For those populations connected to the grid, the inherent limits to electricity access emerge more from economic conditions among these populations, especially their poverty level, than from their location. In these conditions, the paper ends with three pricing recommendations.

Main references

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