

Quality Matters: Power Reliability and Grid Connection in Rural Guatemala.

Federico M. Accursi^a

1. Motivations underlying the research

Even though worldwide access to electricity has been rising from 82% in 2008 to 90.4% in 2020, almost 750 million people still remain in darkness (World Bank, 2022). This is a particularly pronounced problem in rural settings, whose access rate is 15 p.p. less than in urban ones. Although many rural households have benefited from off-grid energy devices like solar panels, more research is needed to study the barriers that impede them from fully exploiting all the advantages the electricity grid provides.

In this paper, we empirically study the role of the lack of reliability as a barrier for rural households to get a connection to the grid or, discourage those already connected from continuing with the service. Poor quality could also provoke conflicts in the form of theft and illegal connections or unpaid bills, triggering a “vicious circle” for a utility company: decreasing firm revenues and, therefore, increasing outages (Dzansi et al., 2018). This issue concerns from a public policy perspective since the investment done to spread the low voltage grid needs social returns. Our results show that these efforts could end up wasted if quality decreases because of, for example, insufficient complementary investments (e.g., transmission and distribution lines).

Guatemala is a good country to focus on. Considered an upper middle-income country by the World Bank, ended a civil war in 1996 and started a reform process, enhancing the rural electricity access rate from 48% to 74% in a decade. However, in 2021, total energy consumption from the residential sector came 90% from firewood and only 5% from electricity even with subsidies to electricity consumption (MEM, 2021). Firewood, mainly used for cooking and heating in rural areas, is typically associated with indoor pollution, and hence, with well-documented negative health consequences.

2. A short account of the research performed

To address our research question, we use data from the National Electric Power Commission of Guatemala (CNEE), which we combine with two household-level datasets, namely, the National Survey of Living Conditions (ENCOVI) of 2011 and 2014, and the 2018 National Population Census. The particular variation of quality observed in time will help us with the identification strategy: after 2011 the number of outages suddenly increased in rural Guatemala. We take advantage of this plausible exogenous shock to analyze the causal relationship between power reliability on rural households’ disposal to connect to the grid.

The objective quality measure provided by the CNEE is the System Average Interruption Duration Index (SAIDI). Our main estimates, which are robust to using an instrumental variable strategy, suggest that households affected by severe outages are about 13-17 p.p. less likely to get a connection to the grid. We further check this result by combining household-level data from the 2018 Census with a complete register of electricity quality service. Although 2018 was a good year in terms of quality, a 1% increase in the number of outage hours affected the probability of connection by 3 p.p.

3. Main conclusions and policy implications of the work.

The main conclusion of this paper is that **households are not captive consumers**. Non-payment, illegal connections, and vandalism are all possible unwanted consequences. In the case of Guatemala, the upsurge of service cut-offs because of non-payment was notorious. To achieve genuine access to electricity and reap its benefits (e.g., clean cooking, improved productivity through better assets, and reduced gender disparities), **maintaining good-quality service is as important as extending the grid**.

a faccursi@unav.es; faccursi@alumin.unav.es;

The importance of rural infrastructure and maintenance cannot be underestimated when it comes to rural electrification. These factors, along with road connectivity, are instrumental in driving the growth of microenterprise (Chaurey and Lee, 2022).

Finally, and as an indirect outcome of our research, we also strongly recommend **a revision of the current subsidy and taxation structure** within the Guatemalan electricity system. The fixed lump-sum fee charged by numerous municipalities for public lighting ultimately undermines the efficacy of subsidies in promoting electricity consumption, leading to a regressive impact. Remarkably, in some municipalities, up to 50% of the bill paid by a very poor household is allocated as a Public Light Fee.