



The long-term adoption of grid electricity: Evidence from rural Rwanda

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- This brief explores findings from a study of a grid extension programme in rural Rwanda seeking to understand the long-run adoption trajectory.
- The study documents low and stagnant connection rates and minimal growth in electricity consumption up to ten years after community grid connection.
- There is no indication of noteworthy enterprise creation or of existing enterprises starting to use electricity productively despite widespread connection.
- These findings support extending debates and policies for electrification beyond the current strong focus on grid electrification.

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Background

Access to electricity is widely recognised as a critical driver of economic development and poverty reduction. As part of the global commitment to Sustainable Development Goal 7 (SDG 7), Rwanda set out to achieve universal access to electricity with the Electricity Access Rollout Program (EARP), the main initiative to expand grid connections to rural areas. The programme, launched in 2009, has helped Rwanda become one of the fastest-electrifying countries in sub-Saharan Africa, with grid electrification rates rising from just 6% in 2009 to 54% by 2023.

Despite these impressive gains, questions remain about the long-term impacts of rural electrification. While short-term studies have shown improvements in household wellbeing, such as better lighting and phone charging, there is limited evidence that electrification has significantly boosted economic development, particularly in the poorest rural areas. Early evaluations pointed to low consumption levels and limited electricity use for productive purposes, raising concerns about whether extending the grid to rural communities would deliver the broad economic benefits initially expected.

Given the considerable financial investments required for rural electrification projects, understanding the long-term outcomes is crucial for guiding future policy decisions. Our study addresses this need by studying communities ten years after they were connected to the national grid, offering valuable insights into the adoption of grid electricity over time.

This study

This study examines rural households and enterprises in Rwanda that were connected to the national electricity grid as part of the EARP. The study collected four waves of survey data from 820 households across 41 rural communities, triangulating these findings with administrative consumption data from 147,000 rural households nationwide. In addition to household surveys, we interviewed community leaders to gather information about local enterprises and the overall community impact.

Data is compared across multiple years to assess long-term impact, with the most recent wave collected in 2022, up to ten years after electrification. This allows us to measure the evolution of electricity adoption and its effects on economic development over time.

Findings

Noteworthy usage patterns in the short-term

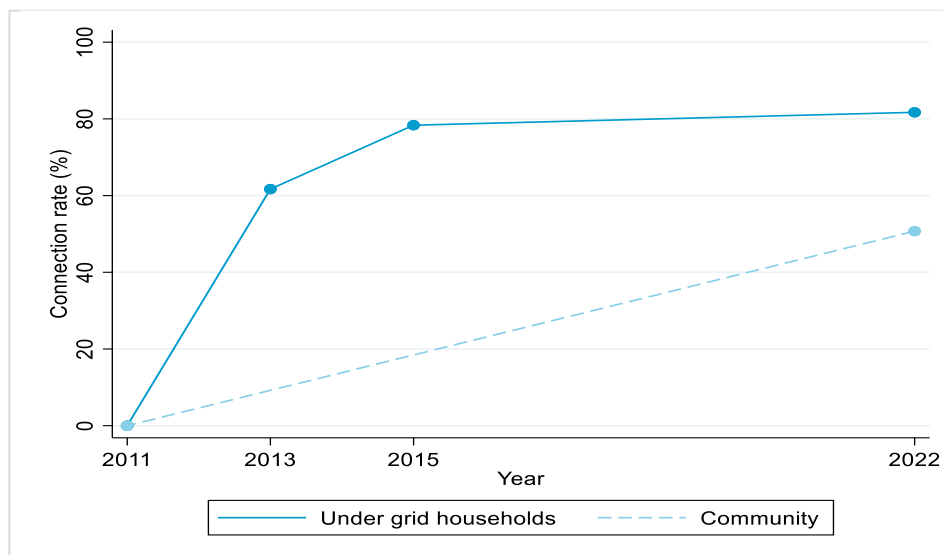
Up to 3.5 years after electrification, we find noteworthy usage patterns. Due to electrification, households use more lighting for studying and other household chores and more entertainment devices and phone charging.

Low and stagnant connection rates

The grid has been extended to almost all communities in the study sample up to ten years after electrification. Furthermore, we do not observe a decline in connection rates and appliance usage, which cannot be taken for granted in the aftermath of the COVID-19 pandemic.

Yet, Figure 1 shows that many households remain unconnected. Up to ten years after the initial rollout, only 51% of households in electrified communities are connected. Even among those located directly under the grid, only 82% have connected, with little growth in connection rates over the years and despite subsidised connection fees and instalment plans to reduce upfront costs.

FIGURE 1: Connection rates over time

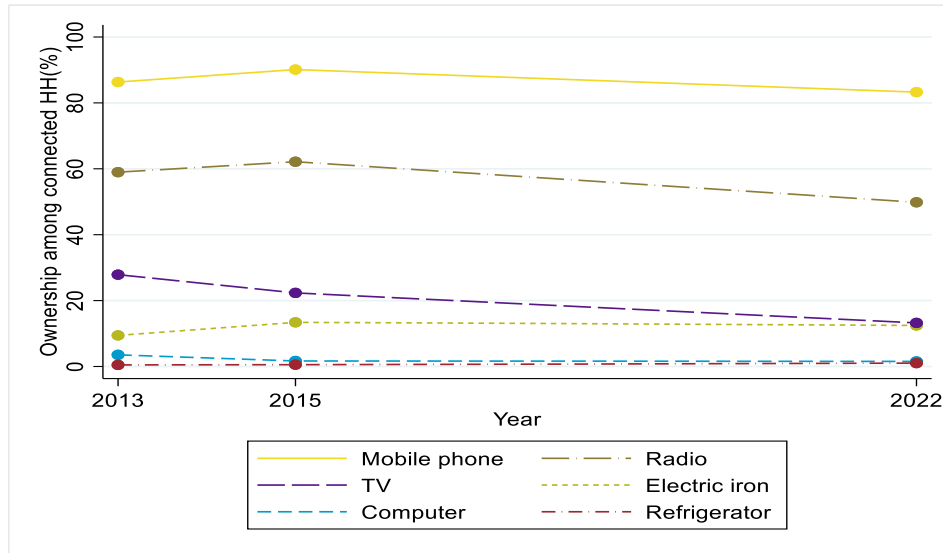


Minimal growth in electricity consumption

For households that are connected, electricity consumption remains very low. The average household consumes just 8.1 kWh per month, a figure that has barely changed since 2013. Most households use electricity primarily for basic needs such as lighting and phone charging, with only 23% owning any appliances beyond lamps, mobile phones or radios (Figure 2). Productive use

of electricity, such as for farming or business purposes, is almost nonexistent, limiting the potential for economic growth.

FIGURE 2: Appliance ownership over time



Limited impact on local businesses

We find no indication of noteworthy enterprise creation or of existing enterprises starting to use electricity productively. While most local enterprises are connected to the grid, few have seen substantial economic benefits from electrification. Most businesses, such as small shops, bars, and hairdressers, use electricity mainly for lighting and devices like television or radio. Only half of the communities have manufacturing firms, like millers, carpenters, and tailors. These firms use grid electricity for equipment operation, though many also continue to work with mechanical or diesel-run appliances despite their grid connection. The creation of new, electricity-dependent businesses has been minimal.

Broader implications

The survey data from 41 communities triangulated with administrative consumption data from a large sample of 147,000 rural households in Rwanda confirm the pattern of low average consumption per household. Other studies in sub-Saharan Africa also document low connection rates and minimal economic impacts from rural electrification programs. Countries like Kenya and Tanzania, which have similarly ambitious electrification goals, face similar challenges. The observed patterns suggest that electrification alone is insufficient to drive economic development in rural areas.

Discussion

Rwanda's experience with rural electrification highlights both the potential and the limitations of grid expansion as a tool for development. While progress has been made in expanding access, the long-term economic impacts remain muted. We derive three policy recommendations:

- **Tackle stagnation and low adoption**

Although our findings confirm sustainable uptake of electricity, complementary measures need to be taken for connected households to address stagnating connection rates and to enhance consumption among households and microenterprises.

- **Consider alternative electrification strategies**

Given the high cost of grid extension and the low consumption levels in rural areas, alternative solutions, such as decentralised solar systems or mini-grids, may offer a more cost-effective way to provide basic electricity services to previously underserved populations.

- **Include long-term monitoring and evaluation**

Electrification projects should include long-term monitoring and evaluation to assess their long-term impact. Our study shows that long-term benefits do not emerge automatically over time, as is often assumed in cost-benefit calculations.

References

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