

Powering the powerless

Economic impact of rural electrification in Ghana



In brief

- Ghana has made significant progress in extending electricity access across the country, particularly in rural areas where access levels rose from 1% to 63% of the population between 1991 and 2014.
- However, huge capital investment is still required to achieve universal access to electricity by the year 2020 under the National Electrification Scheme. The economic benefit of rural electrification projects also remains unclear.
- This paper examines the socio-economic effects of rural electrification on rural households by looking at a variety of measures such as income and welfare levels of rural and urban households.
- The result suggests although electricity access improves the gross income and welfare of households overall, it does not improve employment income in rural areas because electricity does not affect agricultural productivity.
- In addition, high-income households benefit relatively more from electricity access compared to poorer households. This implies that access to electricity has the potential to widen the income gap among rural populations, and to reduce the income gap between urban and rural households.
- The authors conclude that the positive links between rural electrification and welfare justify further investment in extending electrification to rural areas.

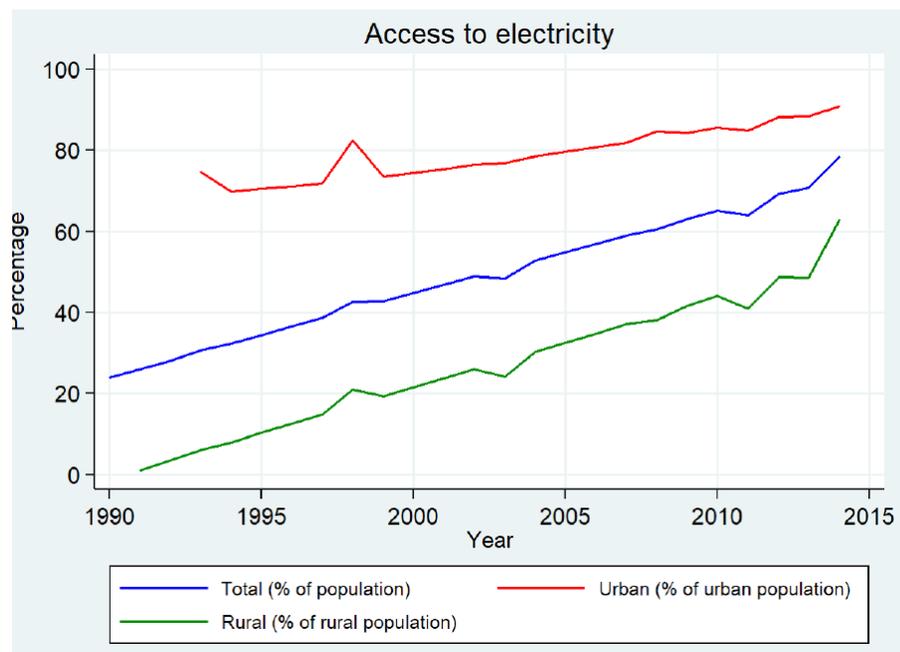
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Introduction

Ghana has made significant progress in expanding electricity access across the country. In 1990, only 23.9% of Ghana's population had access to electricity (Sustainable Energy for All database). Additionally, access levels for the rural and urban population were very disparate — in 1991, only 1.09% of the rural population had access to electricity, while 74.6% of the population living in urban areas had access to electricity in 1993. Figure 1 shows the rate of progress Ghana has made since the early 1990s to 2014 in the area of improving access to electricity.

- By 2014, the electricity access rate in Ghana for the total, urban, and rural population were respectively 78.3%, 90.8%, and 63%.
- Despite the fact that the current access rate among the urban population is nearly 30% higher relative to the rural population, the relative trends in the access rates shown indicate that since the early 1990s, the rate of increases in access is comparatively higher among the rural population. Thus, there seems to be some level of 'convergence' in electricity access between rural and urban populations in Ghana.
- The data also reveals that Ghana has made tremendous progress in extending electricity access in rural areas.

Figure 1: Electricity Access Rate: 1990 -2014



What have been the economic benefits of rural electrification projects? This policy- relevant question remains unanswered in Ghana, to the best of our knowledge. On the basis of the above statistics, there is still huge capital investment required to achieve universal access to electricity by 2020.

Strong evidence of the benefits of the National Electrification Scheme is required in negotiating successful private sector participation, development partners' support, and government budget allocations towards improving electricity penetration into rural areas and electricity access for rural households.

The general objective of this brief is to examine the socio-economic effects of rural electrification on of rural households. Specifically:

1. We study the effect of rural electrification on household income by comparing rural households with access to electricity to rural households without access to electricity.
2. Using consumption- and expenditure-based measures of welfare (consumption/expenditure per household member), we examine the impact of access to electricity on household welfare.
3. We examine the impact of electricity penetration into rural areas on income and welfare distribution by identifying the differential impact of electricity access across the income ladder.
4. Lastly, we study the possible pathways through which rural electrification can affect household income and welfare.

Economic impact of electricity access

Effect on income and welfare

The analysis in this paper reveals the following findings:

- Electricity access improves the gross income and welfare of households. Our results show that real gross income is about 64% higher for the households with access to electricity compared to households without access.
- In the case of welfare, measured by real household expenditure per capita, we found that expenditure is about 63.7% higher for households in rural communities connected to the national grid compared to rural households living in areas without a grid connection. This implies that electricity access improves incomes and welfare of rural households. Policymakers can achieve substantial reductions in rural poverty and reduce inequality in the distribution of income and welfare between rural and urban households through rural electrification projects.
- Electricity access in rural areas does not improve employment income of households. Except due to chance, there is no difference in labour incomes when one compares the average rural household with electricity

with another rural household without electricity. This is not very surprising since agriculture is the main source of wage employment in rural areas and electricity access does not improve labour productivity on farms, as most farm activities are not affected by access to electricity.

Distributional impact

With regards to the distributional effects of electricity access across different households categorised by income, our investigations revealed the following:

“Access to electricity has the potential to widen the income gap among rural populations, and to reduce the income gap between urban and rural households.”

- Access to electricity improves the incomes of relatively high-income households more than low-income households. Real gross income of households in rural areas with electricity were found to be 42%, 81.7%, and 224.4% higher than households without electricity for the 25th, 50th, and 75th percentiles of income respectively. This result implies that: (1) electricity access improves the gross income of all households, irrespective of initial level of income at the time they are exposed to electricity; (2) high-income households benefit relatively more from electricity access compared to poorer households. Thus, access to electricity has the potential to widen the income gap among rural populations, and to reduce the income gap between urban and rural households.
- Electricity access improves the welfare of all rural households, but with relatively higher improvements for high-income households. Compared to households without access, we found household expenditure per capita for rural households with electricity access to be 18.9%, 88.9%, and 532.4% higher for households at the 25th, 50th, and 75th percentiles of the welfare distribution respectively. Similar to the case of real gross income, this result implies that access to electricity has the potential to widen the welfare gap among rural populations, and to reduce the welfare gap between urban and rural households. Rural electrification projects could serve very well as a social intervention programme in Ghana and the rest of sub-Saharan Africa.

Mechanisms

What are the possible pathways through which electricity access can affect income and welfare of rural households? The analyses in this paper show that:

- Ownership of non-agricultural enterprises, income from non-agricultural enterprises, and education are the potential pathways through which electricity access could impact income and welfare.
- In the case of educational attainment, our results show that schooling years is about half-a-year higher, on average, among members of rural households with electricity compare to rural households without electricity, after accounting for household characteristics. However, the effect of education on income and welfare will only be realised in the

long-run, hence we do not attribute the differences in income and welfare between households with access and those without access to education. However, per the results in this paper, this will be an important channel in the long-run.

- We found that both the probability of a rural household in a community with electricity owning a non-agricultural enterprise and the income from non-agricultural enterprises to be higher, 4.7% and 52.4% higher respectively, in comparison with a similar household in a community without electricity access. This suggests that establishment and operation of non-agricultural enterprises constitute an important channel through which rural electrification affect the economic outcomes (income and welfare) of rural households in Ghana.

Policy implications

First, the positive link between rural electrification and welfare has been clearly established by this paper. This implies that there is economic justification for investment in rural electrification in Ghana. Even though the positive impact of rural electrification is higher for wealthier households than poorer ones, it has the potential to reduce poverty through the promotion of not just access but utilisation. This implies rural electrification can benefit the poor more if other complementary actions (subsidising the costs of connections and appliances) are implemented together with the grid extension process since access is only a necessary, but not a sufficient condition, for the improvement of stakeholders' welfare and income.

The findings on income indicate there are good prospects in developing non-farm economic ventures in rural communities with electricity rather than relying on agriculture. Therefore, international development institutions, governments, and other development agencies who are interested in using rural electrification to reduce poverty should target developing off-farm ventures concurrently with rural electrification projects in rural areas. In addition, enterprise development programmes should be designed to encourage end users to utilise electricity. This will offer rural communities the opportunity to put electricity to productive use. Additionally, the increase in nonfarm income has the potential to further increase demand for electricity, which can support cost recovery.