Does Large Scale Infrastructure Investment Alleviate Poverty? Impacts of Rwanda’s Electricity Access Roll-Out Programme

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More than 1.3 billion people in developing countries are lacking access to electricity.

Lacking access to electricity is often seen as a major obstacle to human and economic development.

The United Nations pursue universal access to electricity by 2030 via their initiative Sustainable Energy for All (SE4All).

The Rwandan Electricity Access Roll-Out Program Programme (EARP) is one of the most ambitious electrification interventions in Africa, endowed with a budget of almost 380 Mio USD for its first phase (2009 and 2013).

Between 2009 and 2013, EARP has newly connected 280,000 households attaining an electrification rate of 16% in Rwanda in 2013.
Research Questions

- Take-Up:
  - Do households connect to the electricity grid if they have access to it?
  - How much electricity do they use and for which purpose?
- What are the socioeconomic impacts of using electricity
  - Energy expenditures
  - Access to information
  - Time Use
  - Gender
Representative household panel data of rural target population of EARP

Almost 1,000 households in 15 treatment and 29 control villages. Most control villages are foreseen for electrification through EARP in a later phase.

Baseline survey in 2011. Follow-up in 2013 using standardized socio-economic questionnaire

We apply a difference-in-differences approach combined with propensity score matching to identify suitable control households.
The *before*-situation

- Most important household characteristics are balanced among treatment and control households.
- Most households are subsistence farmers; around 75 percent cultivate land
- Low level of expenditure: ~ 170,000 FRW (208 EUR) annual per capita expenditures; 37% of expenditures are spent on energy
- Usage of few energy services
  - Wick lamps, candles and torches are most common lighting source
  - Very low pre-electrification rate (~5%)
  - Hardly any energy consuming appliances
Results – Take-up behaviour

- 60 percent of households in access area connect to electricity grid
- Very low consumption levels, average of 11kWh per month
- Electricity is used above all for lighting, mobile phone charging, radio and TV usage
HH member in treatment communities go to bed later than people in control communities and are thereby awake on average between 15 and 40 minutes longer.

We do not find any effect on income generating activities and working hours.

Children reallocate their study time and study more after nightfall

<table>
<thead>
<tr>
<th>School enrolment</th>
<th>DiD community</th>
<th>DiD household</th>
<th>Control all</th>
<th>Treatment connected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children between 6-11 years</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All children go to school</td>
<td>0.06</td>
<td>0.17**</td>
<td>0.61</td>
<td>0.65</td>
</tr>
<tr>
<td>Study hours total</td>
<td>0.06</td>
<td>0.29</td>
<td>0.16</td>
<td>0.32</td>
</tr>
<tr>
<td>Study hours after nightfall</td>
<td>0.13**</td>
<td>0.20**</td>
<td>0.19</td>
<td>0.35</td>
</tr>
<tr>
<td><strong>Children between 12-17 years</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All children go to school</td>
<td>0.02</td>
<td>0.14</td>
<td>0.62</td>
<td>0.70</td>
</tr>
<tr>
<td>Study hours total</td>
<td>-0.06</td>
<td>0.14</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>Study hours after nightfall</td>
<td>0.26***</td>
<td>0.38***</td>
<td>0.33</td>
<td>0.60</td>
</tr>
</tbody>
</table>

*Note:* *, ** and *** indicate significance levels of 10%, 5% and 1%, respectively. 
We find significant effects on the acceptability of violence against women.

<table>
<thead>
<tr>
<th>Gender aspects</th>
<th>DiD community</th>
<th>DiD household</th>
<th>Control</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woman thinks it is justified that husband beats a woman if...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...she neglects her children</td>
<td>-0.13*</td>
<td>-0.10</td>
<td>0.40</td>
<td>0.32</td>
</tr>
<tr>
<td>...she leaves home without telling him</td>
<td>-0.12**</td>
<td>-0.06</td>
<td>0.31</td>
<td>0.20</td>
</tr>
<tr>
<td>...she argues with the husband</td>
<td>-0.10**</td>
<td>-0.07</td>
<td>0.22</td>
<td>0.11</td>
</tr>
<tr>
<td>...the food is burnt</td>
<td>-0.05</td>
<td>-0.01</td>
<td>0.15</td>
<td>0.09</td>
</tr>
</tbody>
</table>
Conclusion

- The availability of electricity in rural areas does not change income generating activities of households.
- Impacts are on softer levels such as a greater flexibility of household members to organize their daily routine.
- Through increased mobile phone usage and higher exposure to radio and TV, access to information is substantially improved.
- Apart from the potential for entertainment, this can lead to changes in attitudes.