



## ENERGY INSTITUTE BLOG

# Electrification and the Poverty Trap

*Does an electricity connection help the very poorest households?*

To many people, connecting rural households to the electricity grid in places like Kenya seems like a great way to help the world's neediest. After all, the 1 billion people who currently live without electricity are some of the poorest people in the world. But, what if electricity connections mainly benefit the relatively wealthy in that group?

Development economists worry about what they call the "poverty trap," a version of the idea that it takes money to make money. If that's true at the lower end of the income distribution, a household needs capital to escape poverty — maybe the cash to buy a sewing machine to start a small tailoring business —

which is exactly what very poor people don't have. The effect can reinforce itself, meaning that poverty will persist from generation to generation.

An increasing body of research explores whether the poverty trap exists in practice. For example, people have shown that the stresses associated with living in poverty (hunger, poor sleep, etc.) can lead to lower cognitive skills and lower ability to do physical labor, both of which contribute to lower income levels. It's also a lot harder to [borrow money](#) (<https://energyathaas.wordpress.com/2019/07/29/are-we-looking-for-the-benefits-of-rural-electrification-in-the-wrong-places/>) when you're poor, which makes it hard to invest in capital to start a business. (This [article](https://www.aeaweb.org/articles?id=10.1257/jep.28.3.127) (<https://www.aeaweb.org/articles?id=10.1257/jep.28.3.127>) summarizes recent literature on the topic, some of which supports and some of which refutes the importance of a poverty trap.)



(<https://energyathaas.files.wordpress.com/2020/02/dj6fi0twkaiuzdc.jpeg>)

In [recent research](https://www.aeaweb.org/articles?id=10.1257/jep.34.1.122) (<https://www.aeaweb.org/articles?id=10.1257/jep.34.1.122>) on rural electrification, my co-authors Ken

Lee, Ted Miguel, and I see an example of what could be a poverty trap. Here's what's going on:

### **Evidence of a Poverty Trap**

To understand the impacts of rural electrification, we identified a set of 150 villages in two counties in Western Kenya. Then, we randomly selected half of those villages (75) to serve as a treatment group, while the other 75 served as a control group. In the treatment group, we again randomly divided the 75 villages into 3 sub-groups. We offered villagers in one of those sub-groups a free connection to the electricity grid, which would ordinarily cost a household about \$400. Households in the other 50 villages got lower subsidies – \$150 (meaning they had to pay \$250) in one group and \$250 (meaning they had to pay \$150) in another. The control group could connect to the grid at the regular \$400 price.

In the 25 villages that got a free connection, basically everyone accepted our offer and got connected. In the 50 villages that got a subsidy but still had to pay \$150-250 dollars for the connection, only about 10-20% of the households got connected. One thing we saw, perhaps not surprisingly, is that the households that decided to get a connection in the 50 villages with the low subsidies were a lot better off economically than the households that got connected in the villages offered a free connection. They were more than twice as likely to have a formal bank account, their incomes were twice as high, they had 60% more chickens, etc.



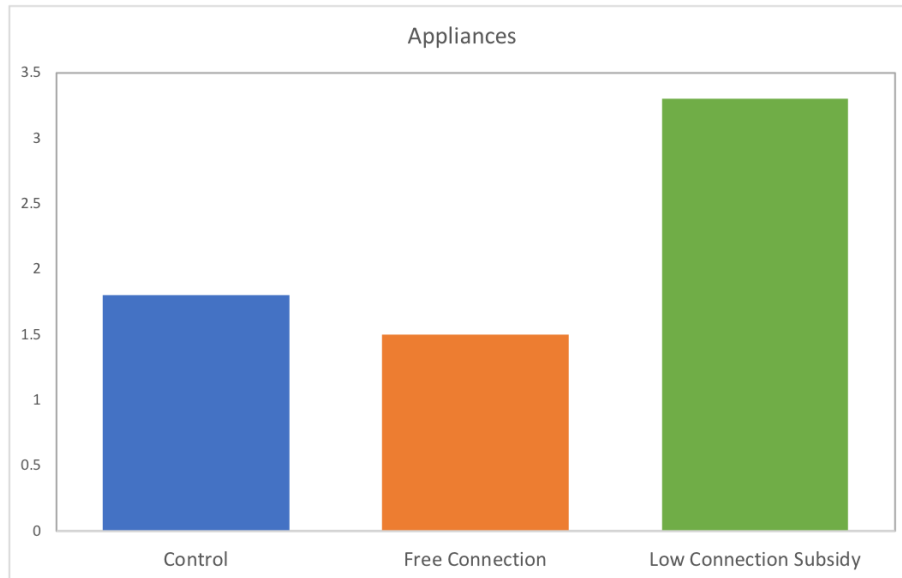
<https://energyathaas.files.wordpress.com/2020/02/poles.jpg>

After villagers had their electricity connections for a couple years, we went back and surveyed all of the households. Overall, we saw very few differences between the households that got an electricity connection and those that didn't – incomes, health, assets, kids test scores, etc. were the same between our treatment and control groups. This was an intellectually fascinating but humanly depressing result, which we elaborated on in [this post \(https://energyathaas.wordpress.com/2018/03/12/does-solving-energy-poverty-help-solve-poverty-not-quite/\)](https://energyathaas.wordpress.com/2018/03/12/does-solving-energy-poverty-help-solve-poverty-not-quite/) two years ago.

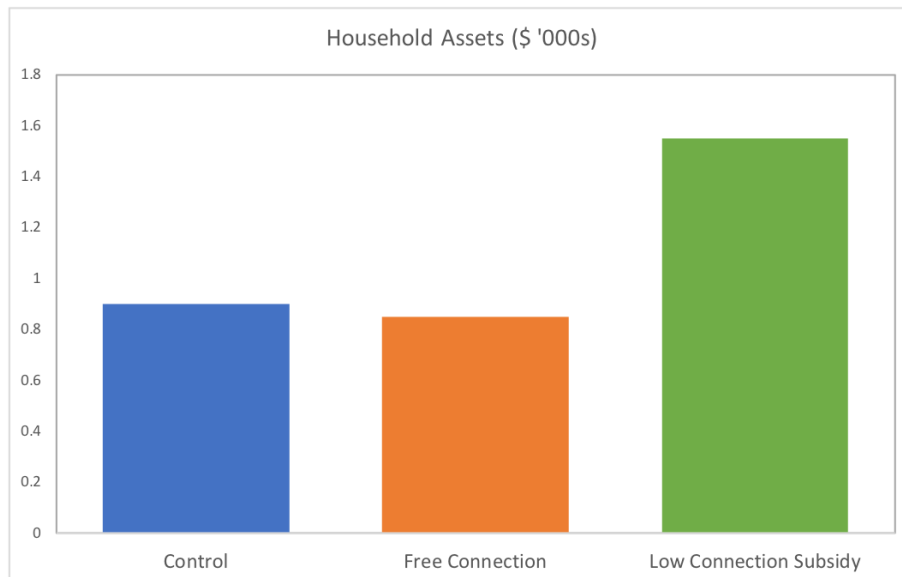
When we looked more closely at the data, though, we saw that the (relatively wealthier) households in the 50 villages that were offered a low connections subsidy seemed better able to do something with their electricity connection. They bought more appliances, they were more likely to start work outside of farming, they saved more money on kerosene, their household wealth was higher.

For example, the figure below reports the results for appliances and household wealth. The blue bar to the left of each figure reflects the control group, where almost no one got a new connection. The orange bar in the middle reflects the households in the communities that got a free connection. If anything, they had slightly fewer appliances and fewer assets.

The green bar on the right shows that the (relatively wealthier) households in the low connection subsidy villages acquired on average 1.5 more appliances after they got a connection and their household wealth went up by about \$500 relative to the control group.



<https://energyathaas.files.wordpress.com/2020/02/appliances.png>



(<https://energyathaas.files.wordpress.com/2020/02/assets.png>)Source:  
**Lee, Miguel and Wolfram** (<https://www.aeaweb.org/articles?id=10.1257/jep.34.1.122>), *Journal of Economic Perspectives*, 2020

There weren't very many households in the right-hand group in our overall sample since only a small share of households got a connection when they had to pay for it. This is why we didn't see any impacts on average. This also means that the conclusions are a bit speculative (that is, they're not all statistically significant).

### **Addressing the Poverty Trap to Benefit from Electrification**

But, the patterns in the figure above are consistent with the poverty trap and bear further exploration. If someone comes and gives you a free electricity connection, you can't start a business or get ahead economically unless you can also afford to buy appliances to use the electricity.

Our study does not prove that this is an example of the poverty trap. It could be, for example, that it was more profitable to be one of a few people to have a connection, which was the case in the 50 low-connection-subsidy villages. Maybe, for example, people in the low-subsidy group went into business providing cell phone charging to their neighbors, but that's only a profitable business if very few of your neighbors have their own connection. This would be an example of correlation not causation. But, [recent work](#)

(<https://blogs.worldbank.org/impacetevaluations/rural-electrification-and-structural-transformation-guaranteed-bet-guest-post-faraz-usmani>) by a pair of researchers at Duke University supports the notion that electrification is more valuable in areas with high incomes.

I do not mean to suggest that we should give up on electrification efforts for the very poorest households. There may be policy tweaks, such as connections accompanied with a free sewing machine or other appliance, to help households

escape the poverty trap when they gain electricity. But, without further considering these possibilities, a broad brush application of a grid connection policy may not bear all the fruits that we expect.

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<https://energyathaas.wordpress.com/2020/02/18/electrification-and-the-poverty-trap/>

[\(https://energyathaas.wordpress.com/2020/02/18/electrification-and-the-poverty-trap/\)](https://energyathaas.wordpress.com/2020/02/18/electrification-and-the-poverty-trap/)

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## **Catherine Wolfram**

Catherine Wolfram is [VIEW ALL](#)  
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Wolfram has published extensively  
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She is currently implementing  
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She received a PhD in Economics  
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# 5 thoughts on “Electrification and the Poverty Trap”

Two obvious thoughts come to mind.

1: Statistically – what would be more interesting would be a comparison of people who started off at the same socio-economic level, since the article already says that the people who got connected in the control & low-subsidy were higher income, which I bet skews the data far more than anything else.

2: The absolute cost – my previous company (Lumeter) was the technology provider to many of the PAYG companies, and the median price of a system was \$200, (paid off at approx \$2/wk for 2 years). That \$2/wk represented an ability to pay for the median person who did not already have electricity. The Kenyan connection price of \$400 plus the cost of electricity is going to in almost all cases cost significantly above that \$2/wk ability to pay (it would take 4 years, just to pay the cost of connection, without any actual power).

Our observation with customers providing both minigrid and stand-alone systems were that there were about 10x more households connected stand-alone, and that the real customer of mini-grid and grid-electrification projects was the donors and aid agencies, which is why they generated so much more publicity (including research studies) than the people selling small stand-alone systems whose customer was the rural poor. 

“When we looked more closely at the data, though, we saw that the (relatively wealthier) households in the 50 villages that were

offered a low connections subsidy seemed better able to do something with their electricity connection.”

Catherine, the reason may be due more to psychology than poverty. I think when most customers are offered a product for free they tend to assign little value to it, and may consider the same product more valuable after it's been priced (and may even consider buying it).

Also, wouldn't people who had invested in an electricity connection be more motivated to make good use of it – so they wouldn't feel they had wasted their money? ←

Pingback: [Electrification and the Poverty Trap - Energy Institute at Haas - Simple Blogging System](#)

I think that there is more to this story than is given in the article. In Tanzania, if one has electricity, one must prepay for the energy you use. Kenya and other African countries the model is the same. One has to go to a store and prepay. You are given a number that you put into the meter and the electricity comes on. When you have used the power you have paid for, the power is turned off at the meter. Everything in Africa is prepaid, including cell phone service. In fact, cell phones minutes are used as a form of money in rural areas of Kenya and Tanzania, because they can be transferred from one phone to another. If one connects the power for free and the people receiving the free connection can't afford to buy the power there is little gained from the free connection. In poor households, the electricity is used for lighting, because it is cheaper than kerosene. The author is correct that being able to afford to buy the appliances is a factor in wealth generation. An interesting thing about Africa is that there are more households with cell phones than have installed electricity. It is also true in Africa that well meaning gifts such as clothes can put the people who sew

clothes out of business, thus cutting off a source of income for many families. ↩

Pingback: [Electrification and the Poverty Trap - Berkeley Haas Insights](#)