



## Stimulating demand for grid electricity

Electrification has a variety of known benefits, including reducing indoor air pollution, improving school enrolment, increasing income, and reducing crime or violence. Sustainable Development Goal 7 set a target of universal access to electricity by 2030. As a result, efforts to increase access to electricity are expanding across the globe. This is to be commended. However, these efforts are not achieving the health, social and economic impacts they could, because many households are choosing not to connect. In resource-restricted contexts, many households that could connect to the electric grid choose not to. This decision is often related to poor quality of the utility, the cost of electrification and electricity, administrative burdens, and other physical or social constraints.

Created by the US Congress in 2004 with strong bipartisan support, the Millennium Challenge Corporation (MCC) is an innovative and independent US government foreign assistance agency helping to lead the fight against global poverty. MCC partners with developing countries that are committed to good governance, economic freedoms and investing in their own citizens to deliver large-scale grant programs to reduce poverty through economic growth. MCC is expanding the electrical grid in two cities in Burkina Faso and wanted to ensure its efforts were used by the most people possible. Alongside the International Initiative for Impact Evaluation (3ie), MCC asked, 'What interventions work to encourage households to connect to the grid?' 3ie conducted a rapid evidence assessment to synthesize the available rigorous impact evaluations of interventions to stimulate demand for electrification in resource-constrained settings.

### Highlights

- There is a surprising lack of evidence regarding the impacts of interventions to increase demand for electrification in low- and middle-income countries.
- Impact evaluations identified in this assessment found that affordability interventions, such as vouchers and subsidies, were successful in stimulating demand for electricity grid connections.
- Affordability-related interventions for grid connections risk disproportionately benefiting the wealthy.
- The included interventions did not address administrative, social or informational, and physical barriers; these are a notable gap in the evidence base regarding interventions to increase demand for electrification.

## Main findings

**We identified 51,320 articles; however, only 7 articles on 4 unique studies met all eligibility criteria.**

One study, which reported on the use of vouchers to reduce the cost of a security inspection required for connection to the grid in El Salvador, was discussed in four separate articles.

The remaining studies occurred in Ethiopia, Kenya and Tanzania and used vouchers or subsidies to reduce upfront costs to electrification. Two of the studies used individual randomization and two used cluster randomization.

**All four studies showed that interventions to promote the affordability of electrification were successful in increasing electrification adoption rates.**

However, connection rates generally remained much lower than expected, not reaching 100 per cent even when connection was fully subsidized.

**In three studies, socioeconomic status was associated with connection to the electrical grid.**

Wealthier and more educated households were more likely to connect, possibly because they were better positioned to pay remaining fees and monthly bills, stood to gain more by electricity

adoption, or better understood payment schemes and the benefits of electrification. However, this means these interventions may have contributed to increasing social inequality.

**The adoption of electrification is related to downstream effects on welfare and time allocation.**

Households tend to purchase electric appliances after connection and may experience an increase in income. Students may have more time to study, and non-farm employment may increase. There are mixed effects on health, as electrification may reduce indoor air pollution but increase the amount of time spent inside.



**Table 1: Effects from included studies in the rapid evidence assessment**

Study	Country	Intervention type	Outcome
Barron & Torero (2014) <sup>i</sup>	El Salvador	Voucher	<ul style="list-style-type: none"> <li>■ Increased probability of adopting electricity connection</li> </ul>
Barron & Torero (2015) <sup>ii</sup>			
Barron & Torero (2017) <sup>iii</sup>			
Torero & Barron (2016) <sup>iv</sup>			
Bernard & Torero (2015) <sup>v</sup>	Ethiopia	Voucher	<ul style="list-style-type: none"> <li>■ Increased probability of connecting for households within 10 meters of households receiving the 10% discount voucher</li> <li>■ Increased probability of connecting for households within 10 meters of households receiving the 20% discount voucher</li> </ul>
Chaplin et al. (2017) <sup>vi</sup>	Tanzania	Subsidy	<ul style="list-style-type: none"> <li>■ Increased probability of households connecting to national grid</li> </ul>
Lee et al. (2016) <sup>vii</sup>	Kenya	Subsidy	<ul style="list-style-type: none"> <li>■ Increased probability of connecting to the grid for households receiving subsidy vouchers</li> </ul>

## Considerations for implementation, sustainability and evaluation of interventions to increase the demand for grid electrification

### There are many barriers to the adoption of grid electrification other than upfront costs.

Voucher and subsidy programs are likely to have diminished impacts if they do not address these barriers as well.

### Households are less likely to connect to the grid if the electric utility is of poor quality.

The benefits of electrification diminish when the electricity is unreliable. Therefore, utilities must be structured to be sustainable. This may include strengthening the utility's ability to collect bills or privatizing the utility.

### In many settings, the administrative process used to connect households to the grid is burdensome.

As a result, households may choose not to connect or may obtain informal connections.

### Physical barriers, including being in a remote location and limitations due to housing structures, can prevent households from connecting.

Remote areas may have higher connection costs due to the need to install long line extensions. Costs can be reduced if more households choose to connect. Nonetheless, certain households – particularly those with homes made of poor building materials – may not be eligible for connection.

### Upfront costs to electrification are not the only economic barriers.

Households must be able to make regular payments after connecting to the grid. This can be challenging for those with irregular income. Economic

constraints may be less obvious as well. To be connected, households in El Salvador had to show land ownership certificates.

This was not always possible for the poorest households.

### Social norms and a lack of information may cause households not to connect.

Households may choose not to connect because of limited knowledge of the payment system or of the advantages of electrification. Households may view electricity as a luxury and prefer not to spend their limited resources on it.

## Implications

### For programming and policy:

Subsidies, vouchers and tariff levels should account for the number of people who could connect to a given line, their geographic distribution and the sustainability of the project. There may be a difference in economic benefits gained from electrification based on the subsidy level. Progressive fee structures may be needed to enable households of low socioeconomic status to connect and prevent increasing inequality. Interventions may be able to increase demand by finding ways to connect ineligible houses, through either providing improved materials or developing safe connection mechanisms. Education campaigns can be used to show the cost and health benefits of relying mainly on electricity.

### For impact evaluations:

There is a stark lack of evidence regarding non-financially based interventions to increase demand for electrification. However, the evidence does show that upfront financial incentives alone are not sufficient to achieve full electrification.

The installation of an electrical grid is a large public works project that is often driven by practical and political considerations, rather than evaluability criteria. As such, randomization and the identification of adequate control groups can be challenging. In addition, there is considerable endogeneity involved in the decision to connect to the electric grid. Careful consideration of model identification strategies should be made before beginning any research project.

If a voucher-based intervention is used, the discount level should be appropriate and feasible. It should ensure those who benefit from the intervention are unique from those who would have connected in the absence of the intervention. The discount level should not be so low that only wealthy households who would have connected regardless choose to take advantage of the intervention. However, the discount level should also not be so large as to prevent the sustainable scaling of the discount.



## Endnotes

<sup>i</sup> Barron, M and Torero, M, 2014. *Electrification and Time Allocation: Experimental Evidence from Northern El Salvador*. MPRA Working Paper Series No. 63782.

<sup>ii</sup> Barron, M and Torero, M, 2015. Fixed Costs, Spillovers, and Adoption of Electric Connections. MPRA Working Paper Series No. 63804.

<sup>iii</sup> Barron, M and Torero, M, 2017. Household electrification and indoor air pollution. *Journal of Environmental Economics and Management*. Elsevier Inc., 86, pp.81–92. Available at: doi: 10.1016/j.jeem.2017.07.007

<sup>iv</sup> Torero, BM and Barron, M, 2016. Impact Evaluation of MCC Compact in El Salvador. Washington, DC: International Food Policy Research Institute.

<sup>v</sup> Bernard, T and Torero, M, 2015. Social interaction effects and connection to electricity: experimental evidence from rural Ethiopia. MPRA Working Paper Series No. 61303. Available at: doi: 10.1086/679746

<sup>vi</sup> Chaplin, D, Mamun, A, Protik, A, Schurrer, J, Vohra, D, Bos, K, Burak, H, Meyer, L, Dumitrescu, A, Ksoll, C and Cook, T, 2017.

*Grid Electricity Expansion in Tanzania: Findings from a Rigorous Impact Evaluation: Final Report*, Mathematica Policy Research.

<sup>vii</sup> Lee, K, Brewer, E, Christiano, C, Meyo, F, Miguel, E, Podolsky, M, Rosa, J and Wolfram, C, 2014. *Electrification for 'under grid' households in Rural Kenya*. NBER Working Paper Series No. 20327. Available at: doi: 10.1016/j.deveng.2015.12.001





## What is a rapid evidence assessment?

A rapid evidence assessment is a targeted systematic review. Similar to a systematic review, it uses a systematic approach to search and screen studies for inclusion in the review. To make it rapid, the search strategy may be limited to certain databases and the scope may be narrowed to focus only on a few intervention types.

## About the rapid evidence assessment

This brief is based on the MCC-funded rapid evidence assessment, *Rapid evidence assessment of the evidence regarding the generation of demand for electrification in low- and middle-income countries*, by Charlotte Lane, Sridevi Prasad and Douglas Glandon. The authors found and appraised the quality of four impact evaluations on interventions stimulating demand for grid-based electrification in low- and middle-income countries.

## About this brief

This brief was authored by Charlotte Lane. She is solely responsible for all content, errors and omissions. This study is made possible by the generous support of the US Government through the Millennium Challenge Corporation (MCC). The contents are the responsibility of the International Initiative for Impact Evaluation (3ie) and do not necessarily reflect the views of MCC or the United States Government. This brief was designed and produced by Akarsh Gupta and Anushruti Ganguly.

The International Initiative for Impact Evaluation (3ie) is an international grant-making NGO promoting evidence-informed development policies and programmes. We are the global leader in funding, producing and synthesising high-quality evidence of what works, for whom, how, why and at what cost. We believe that using better and policy-relevant evidence helps to make development more effective and improve people's lives.

For more information on 3ie's Rapid evidence assessment brief, contact [info@3ieimpact.org](mailto:info@3ieimpact.org) or visit our website.

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