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Timeline
2016-2018

Sample Size
283 villages

Research Implemented by IPA
Yes

Increasing Access to Clean Lighting and Promoting Female Entrepreneurship in Rwanda

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Abstract

Renewable off-grid home lighting systems have the potential to reduce the use of kerosene lanterns and other expensive and dirty forms of light in areas that lack electricity, but adoption of such lighting systems is low. In Rwanda, an IPA research team partnered with the social enterprise Nuru Energy to evaluate optimal pricing structures for lights, ways to enhance gender equity for the micro-entrepreneurs who recharge the lights, and how access to the lights impacts the economic well-being of households throughout the community. According to preliminary results, poor households bought or took home lights when they were offered them either at low prices or for free, while almost no one bought them at market prices; households valued lights as much when they were free as when they had to pay for them. Inconvenience and recharging appear to be a major barriers to usage. Business performance and competition was similar across male- and female-owned microenterprise groups, though female entrepreneurs were less willing to take risks than male ones. Impacts on well-being are still under analysis.

Policy Issue

Nearly 70 percent of people living in Sub-Saharan Africa lack access to electricity.[1] Most traditional power companies find it too costly to extend the electric grid to many rural and suburban areas. Without access to power, households and small businesses typically use

“dirty lighting” such as kerosene-powered lanterns or candles to provide light at night.

Limited access to grid electrification for rural households makes selling renewable pay-as-you-go home lighting systems a potentially lucrative business model for village level microenterprises, ideally while bettering economic outcomes for the entrepreneurs leading such microenterprises. Yet the impacts of such programs have seldom been rigorously studied, and overall adoption of off-grid lighting systems remains low. One barrier to adoption is cost: the price to purchase such systems are often too expensive for the poorest populations to afford.[2] Second, people are accustomed to using kerosene and may not change their habits automatically, even if offered a better alternative.

In addition to addressing the challenge of low adoption, this research examines the gender composition of those running the village-level enterprises, which tend to be male-dominated, and implements a gender quota system to promote female entrepreneurship.

Context of the Evaluation

Although Rwanda has achieved great strides in electrification efforts in recent years, there are large disparities in access to electricity between rural and urban communities; 9 percent and 72 percent, respectively [3] This is representative of a broader trend across the region.

Nuru energy is a for-profit provider of renewable, pay-as-you-go, energy systems. Nuru energy distributes its lighting systems through teams of village-level entrepreneurs (VLE). Nuru’s business model depends primarily on two market outcomes: take-up, the number of lights/systems sold in each village, and usage, the number of times those systems are recharged at a recharging station. The initial price of a light system depends on the number of times that Nuru expects the system to be recharged.

While Nuru's internal data suggested women were more successful than men in selling LED lights in villages, Nuru found that most of it's entreprenreur teams were male. The company was interested in empowering more female entrepreneurs in rural villages in two districts into which it was expanding.

Details of the Intervention

In partnership with Nuru Energy, an IPA research team conducted a series of randomized evaluations, a lab-in-the field experiment, and collected qualitative data to identify barriers to demand for off-grid renewable energy and ways to encourage female entrepreneurship, and also to measure impacts on well-being for the entrepreneurs and the community.

The interventions included setting up solar recharging microenterprises consisting of four entrepreneurs each in 283 villages, randomly assigning the gender composition of these enterprises (all-male, all-female, mixed), distributing rechargeable lights in half of the villages, and implementing a number of pricing and behavioral interventions to increase adoption of lights.

Researchers used household surveys and recharge station data to measure demand for and use of lights, business performance of microenterprises, and welfare of both entrepreneur households as well as other households in the community.

Second, in 18 villages researchers randomly assigned 1,987 households to receive the lighting systems at different up-front prices. This enabled researchers to assess both the optimal upfront price and also understand how the upfront price users pay impacts subsequent usage.

Third, researchers conducted two game-like, "lab-in-the-field" experiments in 129 villages (among 375 entrepreneurs) that mimicked real-life scenarios of competition and risk aversion in order to gauge if and how men and women behaved differently in different business scenarios.

Results and Policy Lessons

Preliminary results *(may change after further analysis and/or peer-review)*

Overall, results thus far have identified important barriers to take-up of clean LED lighting, particularly cost, lack of experience using the technology, and inconvenience of recharging the lights. Some findings including welfare impacts are still under analysis.

Households wanted to buy/take home the lights when they were offered either for low prices or for free; virtually no one took up the lights when they were offered at market prices.

Lights were valued and used when they were free. Varying upfront pricing did not influence the long-term usage of the lights, disproving the notion that people value goods more when they pay for them.

Giving people an opportunity to use the lights for free increased the likelihood they would use them. A three-month free-trial period positively impacted use and micropayments up to six months after the trial is discontinued.

The inconvenience of having to go to a centralized location to recharge the lights was a factor in low usage, preventing many from recharging.

Business performance was similar across male- and female-owned microenterprise groups and neither women or men entrepreneurs shied away from competition.

However, the majority of entrepreneurs were not risk-takers, and women were less willing to take risks than men.

Qualitative results: In semi-structured interviews, VLE study participants said becoming a VLE gave them access to lighting (allowing females to work after dark and males to spend time on finding food for livestock, while children benefit from additional time to study),

supplementary income (e.g. increased food purchases amongst female VLEs and increased leisure expenditures as well as savings amongst male VLEs) and an elevated status in the community.

Sources

[1] “About Us | Power Africa | U.S. Agency for International Development,” accessed October 2, 2018, https://www.usaid.gov/powerafrica/aboutus.

[2] “POWER AFRICA IN RWANDA | Power Africa | U.S. Agency for International Development.” accessed October 2, 2018, https://www.usaid.gov/powerafrica/rwanda.

[3] Ibid.

October 22, 2018