



## The impact of rural electrification on rural micro-enterprises in Niger Delta, Nigeria

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### ABSTRACT

This study examines the impact of rural electrification through extension of existing grid on rural micro-enterprises in Niger Delta, Nigeria. The study used purposive sampling and obtained data using structured questionnaires and personal interviews with the owners of the micro-enterprises. From the data, summary information was obtained and the impact of connection to grid-electricity on the micro-enterprises was examined using a log-linear regression model. The result shows that although not statistically significant, on average, enterprises in communities connected to the electricity grid are 16.2% more profitable than enterprises in communities not connected to the grid, and the use of generating sets in providing back-up electricity makes micro-enterprises more profitable. The study also observed that micro-enterprise owners are fully aware of the importance of electricity access to the profitability of their businesses and those who can afford to buy generating sets willingly do so. Incidentally, the total expenditure on generating sets by some enterprises is up to three times ( $3\times$ ) the tariff for grid-electricity in rural areas. The high cost of self-generated electricity increases the total cost of doing business in rural areas thus reducing the profit margin of the micro-enterprises. In conclusion, for rural electrification to be more effective in improving the living standard of rural dwellers, the larger problem of increasing the national generating capacity and the availability of grid-electricity should be tackled, and rural electrification programs should be carried out alongside other programs that reduce the barriers to establishing micro-enterprises like the creation of rural agricultural co-operatives to promote the productive use of electricity.

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### Introduction

In many developing countries, a large percentage of the population is poor<sup>1</sup> and live in rural areas where there is substantial lack of basic amenities like potable water, good roads, electricity, health facilities, etc. In most cases, these rural dwellers depend on adjoining streams to meet their water needs, have to trek for long distances in search of traditional biomass to meet their energy needs, and cater to their health needs using crude traditional methods. The lack of these amenities poses a barrier to the reduction in the level of rural morbidity, mortality, and improving the living standard of the poor. Concerned about the low standard of living in many developing countries, in 2000, the United Nations established the Millennium Development Goals (MDGs) and set targets to improve the standard of living of the world's poor (UN, 2000). Although not part of the MDGs, access to clean and affordable energy, especially electricity, is necessary if the MDGs are to be met. For example, to achieve universal primary education, electricity is needed for good lighting for reading in homes and to power some teaching aids; to reduce child mortality and improve maternal health, electricity is needed in health facilities to power refrigerators for preserving drugs and vaccines, etc.

Studies have shown that there is a high correlation between the level of electricity consumption and human development index, especially in developing countries (Meisen and Akin, 2008). Given the critical role of access to electricity in meeting the MDGs and in ensuring the development of rural areas, many developing countries strive to provide electricity to their populace.

In Nigeria, successive governments at the different tiers have tried to provide electricity using rural electrification programs which involves extending the existing distribution lines to rural communities. Such programs have huge potential benefits because the availability of electricity and other basic amenities can increase the productivity and profitability of existing micro-enterprises,<sup>2</sup> and also reduce the barrier to the creation of new micro-enterprises (Kooijman-van Dijk and Clancy, 2010; Nichter and Goldmark, 2009) which in turn may increase the available disposable income that may be used to improve the standard of living. Cabraal et al. (2005) noted that access to electricity has a significant impact on rural development only when it is used efficiently and on income-generating activities. However, these potential benefits may not be derived since rural electrification through extension of the distribution lines does not necessarily

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<sup>1</sup> "Poor" in this study is defined as people living on less than US\$1 per day.

<sup>2</sup> A micro-scale enterprise is defined in this study as enterprises with not more than 5 employees and a capital outlay of not more than N750,000. For better understanding of the monetary figures used in the study, an exchange rate of US\$1 = N155 may be used.

translate to availability of electricity, especially given the larger problem of low electricity generation capacity and high transmission and distribution losses faced by the Nigerian electricity sub-sector. Despite the prevalence of this rural electrification approach in Nigeria, very little has been done to ascertain its impact on the socio-economic situation in rural areas. This study intends to examine how connection to grid-electricity has impacted micro-enterprises in rural areas in Niger Delta, Nigeria. The result of the study will bridge the knowledge gap in this area and also provide policy makers useful suggestions on maximizing the potentials of rural electrification in rural development in the region.

The study is organized as follows: after this brief introduction will be a review of related literature. In the third section, we will present the methodology of our study. The fourth section will be the presentation and discussion of results, while the final section will give some concluding remarks and policy recommendations.

## Review of literature

Several studies have been carried out on the impact of access to electricity on small and micro-scale enterprises in developing countries (Little, 1987; Neelsen and Peters, 2011; Tybout, 2000). Little (1987) investigated the role of small and micro-enterprises in fostering economic growth and underscored the importance of electricity access as a basic ingredient of firm development. Tybout (2000) found electricity access to be one of the decisive components of business success in developing countries. Using micro-firm level data from World Bank's enterprise surveys, Eifert et al. (2008) found that what they define as indirect costs explain low productivity in Africa and that energy constitutes the largest. Neelsen and Peters (2011) assessed the impact of electricity access in micro-enterprises in Uganda using quantitative firm-level data from 200 enterprises complemented by qualitative case studies. The study found out that there was little direct impact of electricity access on firm profits or worker remuneration. However, there was significant indirect effect mainly due to increase in demand for goods and services prompted by migration from non-electrified to electrified communities. The study concluded by stressing the need for productive energy promotion policies to be put in place to assist local entrepreneurs to make informed business decisions.

Arnold et al. (2008) investigated the effect of the reliability of electricity supply and generator usage on firm productivity in 10 African countries. They found that reliability problems of the electricity grid had a statistically significant negative impact on firms' total factor productivity, while generator possession had a statistically significant and positive effect. Bastakoti (2003) examined the role of enterprises for the effective use of electricity in Nepal and noted that rural electrification in isolation, without any complementary service mechanism and policy co-ordination, will not create the necessary development impacts.

Combining quantitative and qualitative survey instruments such as participatory rural appraisals (PRA), Kirubi (2006) discovered a positive contribution of electricity provision to micro-enterprise growth in rural areas. Cabraal et al. (2005) stated that access to modern energy services could facilitate the productivity of small and medium-scale enterprises (SMEs), boost agricultural production, and improve health conditions. Kooijman-van Dijk (2008) examined the decision to take up modern energy and how it might translate into impacts on firms. The results showed positive effects of electrification on working hours that increase the flexibility of entrepreneurs. Furthermore, the study highlights "non-material impacts" such as improved comfort for and increased social status of entrepreneurs.

Peters et al. (2009) highlighted the need for complementary services such as sensitization campaigns or business developing services to promote the productive use of electricity to accelerate the impacts of rural electrification by reporting experiences gained in rural Benin. The study concluded that "responsibility of complementary services

should be in principle with the grid operator, while the regulatory bodies have to assure welfare orientation of the services." Peters (2009) presented different approaches to evaluating rural electrification programs taking into account specific challenges faced by researchers in such interventions. The study suggested that ex-ante evaluations be carried out on yet to be electrified target region and already electrified regions. Such evaluations will provide robust evidence on impacts and provide good insights for project design. Fishbein (2003) surveyed the productive use of electricity in several countries and observed that electricity is being used in businesses, irrigation, pumping water, and in other activities that improved the living standard of the people, albeit at different levels.

## Methodology

### Study location

The study was conducted in Akwa Ibom State, Nigeria. Akwa Ibom State is one of the 36 states in Nigeria located in the Niger Delta region of the country and sharing boundary to its south with the Atlantic Ocean. The state falls within the tropical rain forest agro-ecological zone and has two climatic seasons – the rainy season which lasts from April to October and the dry season which lasts from November to March. The settlement pattern in rural areas in the state is scattered and clustered with average household size of 5.1 (NBS, 2009). Agriculture is the predominant economic activity in the rural areas with majority of people engaged in oil palm and cassava cultivation for domestic and to a lesser extent commercial purposes. Rural communities in the coastal areas engage mainly in fishing. Other non-agricultural micro and small-scale enterprises are soap making, raffia, tailoring, hair dressing, grocery retailing, etc. also thrive in the rural communities. To examine the impact of rural electrification on micro-enterprises, the study employed purposive sampling to select four rural communities – two electrified and two non-electrified. The electrified communities selected for this study are *Ikot Obio Odongo* and *Akpa Utong* villages in Ibesikpo Asutan Local Government Area while the non-electrified villages are *Ikot Ekpong* and *Ibio Ette* Villages in Mkpato Enin Local Government Area, all in Akwa Ibom State.

### Data collection and analysis

Data used in this study were collected using purposive sampling survey carried out in October, 2012. Primary data were obtained through questionnaires and interviews with the owners of the micro-enterprises in the communities. The survey questions probed the contribution of grid-electricity to the growth of the enterprises and were divided into four sections.

- (a) Personal information (of enterprise owners) which covered information on the background of enterprise owners including age, sex, educational attainment, and marital status.
- (b) Business and electricity access information which covered the type of business, the number of years of existence of the business, the time of the day the business is carried out, electricity usage in the business, the source of electricity, the regularity of grid-electricity supply, etc.
- (c) Impact of electricity on business which determined the daily cost and revenue to the enterprises and the level of the impact of grid-electricity access on the enterprises.
- (d) Cost of electricity which covered the expenditure of enterprises on grid-electricity supply or alternative sources (generating sets) and the maximum amount enterprise owners will be willing to pay to have steady grid-electricity.

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