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# **Rural Electrification and Women Empowerment in Uganda: Evidence from Micro-data**

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Supervisor's Name: Dr. Aimable NSABIMANA

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## Declaration

I, the undersigned, declare that this Thesis is my original work, and has not been presented for a degree in University of Rwanda or any other universities. All sources of materials that will be used for the thesis work will have been fully acknowledged.

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Date of Submission: 02 November, 2020

This thesis proposal has been submitted for examination with my approval as a university advisor

**Thesis Advisor:** Dr. Aimable NSABIMANA

**Signature:**



## **Dedication**

To my beloved Family

## **Acknowledgements**

Firstly, I would like to express my special appreciation thanks to my Master thesis supervisor, Dr. Aimable NSABIMANA for his support and guidance during the course of this thesis. I would especially like to thank the World Bank, which has provided scholarships to pursue higher education at the African Centre of Excellence in Energy for Sustainable Development (ACE-ESD) in University Of Rwanda-College of Science and Technology.

Finally, I would like to thank my family for their continued support and encouragement

## **Abstract**

Access to electricity has been revealed to fast-track occasions for women by moving them into more profitable exercises, however whether development in financial results likewise norms from change gender standards and practices inside the family unit stays indistinct. This examination analyses the linkages between electricity access and women strengthening, utilizing two waves 2010/2011 and 2011/2012 panel data from the Uganda Bureau of Statistics (UBS). To measure women empowerment decision-making ability, including: (i) Time allocation on different activities, (ii) household assets ownership and income (iii) Contraception Method adopt. Based on Fixed Effect models, the investigation discovers that electricity access improves all indicators of women's strengthening. Income and assets values are higher in Electricity users household compared to other Household with no access to electricity, time allocation for different economics activities is identified through Hours spent weekly in different home activities such as Fetching water, Firewood collection, food processing and farming activities, our results show the total numeral of hours used up in those home-based accomplishments are less for Electricity users households compare to electricity non-users. Finally for the contraception Method adopts, the results of our study have highlighted the likelihood of contraception use among electricity users' versus non electricity users. This could be explained by the access to health information from mass media (TV, Radios, smart, phones...) on the other side non users are limited to public health education provided in general meeting in their community, the electricity users will benefit both information. This study suggests that electric energy access can be a significant for policy makers aimed improving the equity and gender equality for social transformation.

**Key words:** Micro-data, fixed-effects and Women Empowerment

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## **List of Abbreviations**

ESMAP: Energy Management Assistance Program

FE: Fixed effect

HDS: Human Development Surveys

IEA: International Energy Agency

RDHS: Rwanda Demographic and Health Survey

REP: Rural Electricity access Project

SDGs: Sustainable Development Goals

UNHS: Uganda National Household Survey

UNPS: Uganda National Panel Survey

USD: United States Dollars

## **Certification**


This is to certify that this thesis has passed through the anti-plagiarism and found compliant and this is approved final version of the thesis.

Title: Rural Electrification and Women Empowerment in Uganda: Evidence from Micro-data

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**Thesis Advisor:** Dr. Aimable NSABIMANA



## **CHAPTER ONE: GENERAL INTRODUCTION**

### **1.1. Background of the Study**

Today, 770 million people have no access to electricity and hundreds of millions live with unreliable access to it (IEA, 2019). People with access to electricity increased from 1990, around 71% of the world's population had access to electricity, then increased to 86% in 2016 which means that 13% of the world didn't have access to electricity in 2016(IEA, 2016).However the progress remain uneven as 75% of people who can't access live in sub Saharan, where Uganda our country of interest belongs too. Distinguishing the noteworthiness of women strengthening, the United Nation notwithstanding "Accomplish sex fairness and engage all ladies and young ladies" in its 17 Sustainable Development Goals. The World Bank also has focused on gender mainstreaming being developed help, distinguishing women strengthening as a fundamental pathway to supported insolvency decrease and shared thriving. The absence of electricity access is experienced particularly by individuals and includes various outcomes. The comparable applies for admittance to electricity which impacts ladies and men in fluctuating manners .Toward the beginning of the 1970s, rural electricity access was viewed as a critical need and the aftereffects of its mediations were believed to be a preferred position for the family units all in all, to construct occupations and to improve family well-being. In any case, concerns were raised about the impacts of remote area electricity access on earnings and family well-being during the 1980s, linkages that had been set up between remote area electricity access and poverty lightening, preparing, prosperity, earnings and business must be minded. Regardless, the 1990s set apart as the beginning of agricultural nations as significant business sectors for sun powered home schemes and remote area electricity access was progressively more seen as a vital part in a synergistic substructure correspondences supporting financial and social improvement (Winther, 2014.)

The policy in Uganda has been to give electricity to those communities that are progressively gainful and all the more densely populated, however to urge all households to connect to the grid once it is accessible in the community .Uganda's Rural Electricity access Project (REP) has the objective of accomplishing a 10% rural electricity access rate, a net increment of 400,000 households, by 2015. The essential goal was to decrease imbalances in access to electricity and associated opportunities for expanded social welfare, education, health, wellbeing, and income generation (Kelkar, G., and D. Nathan., 2005.).

The Sustainable Development Goals (SDGs) try to change the course of the 21st century, tending to key difficulties, for example, poverty eradication and hunger, taking out disparities and violence against women and young women, and fighting atmospheric and climate change. Gender impartiality and women strengthening are essentials for accomplishing these and other global objectives. Along these lines accomplishing gender impartiality and women strengthening is a stand-alone objective—SDG 5—and incorporated over the other goals, with numerous objectives explicitly perceiving gender equality and women' empowerment as both the target furthermore, some portion of the solution.

Existing writing have demonstrated the significance of electricity access on employment and other labour market outcomes, yet what is missing is the impact of this effect, particularly in developing countries. Discoveries from study discovers whether the effect of electricity access on women empowerment contrasts among communities. This will help policy makers, stakeholders and partners to recognize integral strategies and complementary policies, programs to be presented with the aim of electricity access for improving the lives of individuals in the community and family unit especially women in the household it examines also what degree and how do productive uses of electricity upgrade women's livings?

Furthermore, as developing countries are endeavouring to formalize their economies to improve the standard of life of its residents.

This is significant for open approach public policy making, structure, definition and usage of strategies in developing countries as they are expanding their power electricity infrastructure.

A supplementary optimistic view of the importance of rural electricity access and its relation to poverty reduction has stimulating implications for rural development strategies as a whole. Fast-tracking the introduction of basic, clean energy services is seen as a significant strategy for stimulating sustainable development in rural areas. Still, many people worldwide lack access to modern energy, such as electrical energy, and Africa delays behind other developing regions of the world such that sub-Saharan African countries are more affected compared with others. Support to rural electricity access is therefore given high main concern by the national governments and donor organizations. Besides, there is a trend to encourage the participation of other actors than national utilities for putting into practice of rural electricity access. However, little has been done to identify the impact of electricity access to the women empowerment in rural family units. This problem has affected many people towards their

development economics in different sectors and until now there are still many issues prohibiting people to achieve daily business activities. Therefore, this study on Uganda attempts to channel such knowledge gap in literature. Since this research highlights women's empowerment option as a procedure towards gender equality, this could be a concept that requires analytic consideration regarding to females and males.

## **1.2. Problem Statement**

Current literature (eg Maleko, 2005; Weingart, 2000; 2000; Allderdice and Rogers, 2000) had only evaluated accessibility to grid electricity services and micro enterprise development, drivers and obstructions to rural electrification, influences of access to electrical energy to rural enterprises. However, little has been done to identify the impact of electrification to the women empowerment in rural family units. Therefore, this study on Uganda attempts to channel such knowledge gap in literature, since this thesis will consider women's empowerment as a procedure towards gender equality, hence this will be a concept that requires analytic consideration regarding to females and males.

## **1.3. Objectives of the Study**

### **Major Objective**

To examine how access to electricity and women empowerment are associated in rural Uganda, using Uganda NPS

### **The Specific Objective**

To identify if electricity interventions would improve women welfare through income generation and labour force participation and increased working hours outside home.

To examine the impact of electricity penetration into rural family units on income and welfare distribution through empowering females. To determine household females' income and assets value obtained from activities carried out as result of electricity accessibility.

## **1.4. Research Questions**

Concerning electricity access and use, what aspects affect women' empowerment? With Sub-questions:

To what degree and how do women has access to electricity at home in ways that enrich women's empowerment

To what degree and how do productive uses of electricity upgrade women's empowerment?

### **1.5. Research Hypothesis**

Based on the objective and research questions listed above, two hypotheses tests are developed and tested. Assume 5% level of significance, and test the following null and alternative hypothesis:

*H<sub>0</sub>*: Rural Electrification does not contribute to Women Empowerment in Uganda

*H<sub>1</sub>*: Rural Electrification contributes to Women Empowerment in Uganda

The assumption of the study is that Access to electricity has a number of positive effects on women empowerment in family unit of rural Uganda.

### **1.6. Scope of the study**

The study will focus on the electrification in rural households in Uganda and examine the correlation of electricity access with the determinants of the women empowerment. This correlation between these variables of interest will be analysed for all rural household in the surveyed data from Uganda National Households Survey (UNHS).

### **1.7. Expected Outcomes and Significance of the Study**

#### **1.7.1. Expected Outcome of the Study**

- Ending discrimination against women as result of improved infrastructure.
- Electricity access will be highly valued as a labour reducing tool
- There will be decreasing in the time and hardship that females spend doing drudgery tasks (for example fetching firewood collecting firewood, food processing and farming activities).
- Women will utilize their resulting freed-up saved time to pursue after income generating activities and along these lines they become monetarily engaged and economically empowered.

- Electricity access will extend women's workday and thus increasing women's overall workload
- Electricity access will improve the female's health conditions to a large degree and help them to make decision through using contraception methods.

### **1.7.2. Significance of the Study**

Access to electricity doesn't only influence household burdens but in addition gives the opportunity to enhance income generating activities just as to improve gender relations and increase in welfare of both women and men (Cecelski 2004, 2005; Clancy et al. 2003; ENERGIA/DFID Collaborative Research Group on Gender and Energy 2006; UN 2005; UN DESA 2010). Most studies analysing outcomes of household electrification focus on households' units though gender orientation measurements are once in a while thought of. It is broadly expected that women benefit from rural electrification as women spend more time at home, thus household electrification improves their working and living conditions. Nonetheless, it is frequently left aside that power relations among men and women highly influence the benefits of rural electrification (Cecelski 2004). The absence of research focusing on the impact of electrification on women' lives is particularly astounding considering the communicated duties to help gender equality and orientation correspondence by the international benefactor network and the size of investment put into electrification projects (Köhlin et al. 2011). Current researches often focus on the direct advantages of access to electricity, for example, saves costs of kerosene, lamp oil, diesel, candles and batteries; anyway indirect outcomes like health wellbeing impacts, income generating activities, educational benefits and specific gender impacts are insufficiently looked into.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

Empirical studies illustrate that electricity access disproportionately benefits ladies and young ladies. In families with electricity, females invest less used up time on family unit responsibilities and are bound to partake in earnings generating deeds, and young ladies have higher educational accomplishment (Samad, Hussain, and Fan Zhang. , 2017). What is less perceived is whether upgrades in well-being results likewise enable ladies and change gender norms standards and practices inside families. The examination did indicated that electricity access can rise females workforce involvement ( (Dinkelman T. , 2011.); (Samad, Hussain, and Fan Zhang. , 2017); (Khandker, S. R., H. A. Samad, R. Ali, and D. F. Barnes. , 2014.). Ladies with an independent autonomous earnings are probably going to have more noteworthy bartering force and authority over resources inside the family unit. Second, electricity access may prompt better wellbeing results for females. Sound females are better ready to effectively take an interest in the public areas and markets and make aggregate move to propel their own personal organization and strengthening (Khandker, S. R., H. A. Samad, R. Ali, and D. F. Barnes. , 2014.). The other investigation uncovered that electricity access empowers more noteworthy introduction to electronic media, for example, TV and radio. Improved admittance to data may widen skylines about open doors for females monetary strengthening, social and political involvement. The investigation did by Samad and different creators conveyed that electricity access can prompt better schooling results for young ladies (Samad, Hussain, and Fan Zhang. , 2017). Better educational results for young ladies could catalytically affect practically all elements of improvement, including women strengthening over the long period (Duflo, 2012).

### **2.2. Empirical Review**

The review of empirical studies show that a great number of researchers has obtained a positive relationship between electricity access and women empowerment but in the pas review of literature has focused on electricity provision; making services of electricity available to poor people and increasing demand and supply of electricity.

Mostly women are responsible for households' duties especially in rural areas where women spend considerable time such as collecting firewood, fetching water, food processing and other domestic activities, access to electricity will facilitate for more efficient product to use in these



tasks. (Dinkelman T. , 2011)in south Africa has found that access to electricity in rural areas has raised women employment in their community by 9.5% because it released them from domestic activities and allow them to participate in microenterprises; another study in (Salehi-Isfahani, D., and S. Taghvatalab., 2014.)demonstrates that access to reliable electricity allow rural women to work outside home by 23% due to more efficient home production in the form of lighting and modern cooking appliances, improving these basics conditions will allow women to participate in local economy whereas informed individuals, Healthy, safe, are more apt to be productive.

The study done (Annecke, 2005) (Dinkelman T. , 2011) by in South Africa about the contribution of women through adoption of electricity access opportunity showed that women employment increase by 9.5% on IV results. This was done during a census. This translates that contribution of women in labour force is 15000 more than men. To the same study, the fixed effect model also revealed that the percentage level of female contribution is greater than men even though the precise inference is somehow difficult with the small sample to be obtained. The study showed that adoption of electricity increase work especially on the intensive margin for women. This is because in districts with the average increase in electricity access over the period (15 percent), women work about 8.9 more hours per week, a 3.5 percent increase. On other side, the study showed that male employment rises are insignificantly in electrifying areas, although to a lesser degree than for females (Panjwani, 2013).

In Nicaragua, electric energy caused a day by day efficient in gathering fuel of around 60 minutes (ladies: 45 minutes, men 65 minutes) where men invested twice as much energy in this movement than ladies before electric energy access, (Grogan, L., and A. Sadanand. , 2013). In this last case, the move in cooking advancement was a documented explanation for the decline in drudgery, while in the Nicaraguan case the makers suggest that the reduced time used to assemble fuel might be associated with a creating take-up of gas cooker (Grogan, L., and A. Sadanand. , 2013). Another assessment from India which examined the association between nonelectric anyway implied present day ovens found that power improved the likelihood of having a light fuel oven by 13 percent and that such things were kept by 56 percent of those with electricity access (Grogan, L., and A. Sadanand. , 2013).

The reviewed statistical studies they regularly utilize displaying for assessing electricity's effect utilizing huge informational collections that get either from energy overviews led in the latest past. The essential reason for these examinations is to measure the effect of having electricity

access (Standal, K., and T. Winther. , 2016). They entirely emphasis on rural, remote and urban areas with the grid connection, considering such access in binary terms: whether people have a subscription or not (Skutsch, 2005.). They intended to test postulates with predefined dependent variables on which the level of electricity's impact is dignified (Matinga, M. N., and H. J. Annegarn., 2013). Thematically, many of these studies considered at particular indicators of electricity's impact based on gender on welfare indicators (Grogan, L., and A. Sadanand. , 2013). For example, they observe to what degree household access to electricity reduces the time allocation for women (and men) enhances children's enrolment in school or spend on drudgery. Others emphasis on measurable resources either electricity's impact on women's employment (Winther, 2014.); (Van de Walle, 2015.)And/or changes in fuel use. Electricity's impact on fertility rates and gender norms, henceforth overarching issues, has also been considered (La Ferrara, E., A. Chong, and S. Duryea. , 2012.). some of these studies are 'causal' in that they analytically control for other aspects that may clarify the observed changes between households without and with electricity ( (Jensen, R., and E. Oster. , 2009.); (Dinkelman T. , 2011); (Khandker, S. R., H. A. Samad, R. Ali, and D. F. Barnes. , 2014.). Others simply show a correlation between selected variables and electricity access (Heltberg, 2004).

In the Philippines (ESMAP 2002) there was the significant reduction in total drudgery (firewood included) by one hour per day. In certain states in India, where women without electricity spent twice as much time collecting fuel as men spent on this activity, both genders decreased their time allocated by 3.3 hours per month (Khandker, S. R., H. A. Samad, R. Ali, and D. F. Barnes. , 2014.).

The electric light introduction may talk into a reorganising of tasks. An instance in India observed that women with access to electricity started preparing the evening meal half an hour earlier than without electricity (Millinger, M., Marlind, T., Ahlgren, E. O., 2012), and such time reallocation was also proposed as a justification for decreased drudgery in one of the econometric studies ( D. Barnes and M. Sen., 2004.).

In Afghanistan women said that their daughters would support them in the nightfall (carpet weaving and other chores) and go to school during daytime as a result of the coming of the electric light, (Standal, 2010.). Likewise, an econometric study from India proposed that a reallocation of girls' home duties from daytime to the evenings resulted to girls' increased enrolment in school, by this means reducing parents' opportunity cost of sending their

daughters to school (Van de Walle, 2015.). In contrast, girls in Madagascar the electricity access didn't change the degree to what they help their mothers, but with their study time reallocation from daytime to the evenings, when they would get help from their parents (Daka, K.R., Ballet, J., , 2011.).Lastly, as new technologies turn out to be available the 'gender' of traditional practices may change and in turn lead to more interest of time-saving technologies, Some men engaging in cooking and ironing as result of the introduction of electric appliances from the two studies from South Africa (Annecke, 2005).

The Earlier reviews on energy interventions and gender have called for a need to move away from gender-blind approaches towards addressing women and their interests in electrification policy and practice (Clancy, J., M. N. Matinga, S. Oparaocha, and T. Winther, 2017).

The contribution of electrification towards women empowerment has been done by different researcher based on gender norms as well as practices. Some assumption to these norms prohibits women from benefiting electrification opportunities compare to man opportunities (Winther, 2014.).The study done in Africa by researchers using qualitative studies and mainly focused on the informal sector revealed that women use electricity tend to increase their income either by establishing and running shops (Matinga, M. N., and H. J. Annegarn., 2013) . To the same study, by producing income from home the study carried out that using electricity to process and sell food can rise income gained by households (Standal, K., and T. Winther. , 2016). As for first example of the case, women in Bangladesh reportedly increased their income by 0.44% USD per year by using electrified tools for income generating activities such as rice hulling and Shea nut grinding (Samad, Hussain, and Fan Zhang. , 2017)On other side, In study done in two Indian cases showed that electrification did not affect women's income as indicated by outcome found by (Standal, K., and T. Winther. , 2016.).

Some studies showed that women can be benefited from electrification opportunity, there is a controversy showed that in some circumstances they are pointed out to this occasion and this was obtained in study carried out by (Standal, 2010.)In His findings the result demonstrated that women had limited power to decide on the spending of their incomes. As a result, their material endowments did not increase. In the same line, the outcome from Afghan case shows that women's increased economic opportunities do not necessarily lead to their increased control of these resources. As consequences, the influence over decision-making become a crucial element for assessing empowerment. On the side of financial support, the results from some scholars supported the contribution of loan supplied to women investments. The study

taken has showed that the introduction of a financing mechanism subsidised poor and ‘female-headed’ households (Dinkelman T. , 2011.). This was based on single ladies families expanded the connection rate among female-headed family units from 63 percent to 90 percent. In other examination taken in South Africa, uncovered a similar outcome. Implying that a sweeping sponsorship for connections prompted a significant level of connections even among helpless families and an 'essential' level of utilization gave around 50 kWh of free power every month per family (Matinga, M. N., and H. J. Annegarn., 2013)

Women empowerment do not only provided by financial support towards electricity access but also the way of getting opportunities to the other services. The review of literature made on lighting service showed that it is men slightly than women who have a tendency to to choose on and be accountable for payments to the grid and they demonstrated also that a reduction of domestic activities promote women to watch television and use mobile phones and finally they gain enough time to relax and to interact with others (Clancy, J., M. N. Matinga, S. Oparaocha, and T. Winther, 2017). Women and men tend to improve their communication (Standal, K., and T. Winther. , 2016.). Electricity also will facilitate women’s mobility outdoors because it will stimulate security around homesteads (Standal, K., and T. Winther. , 2016)

Furthermore, the research done in other dimensions show that Electricity access increase women ‘skills and knowledge in different ways. For example, in during evening they will find enough time to educate their kids and innovate the way of dressing eating etc. (Daka, K.R., Ballet, J., , 2011.).

Additionally, the study carried out to uncover starting bits of knowledge about the advantages experienced with clients by utilizing Solar Sister's perfect energy items was found to make benefits for singular ladies and their family units as well as the networks. These were accomplished by upgrading pay and self-governance; business abilities and administration; correspondence and correspondence; family unit wellbeing and soundness; kid training; versatility and status; and network security (Solar Sisters, 2019)

Finally, other study has shown that access to electricity also benefits the women who tried to create such business. These include hairdressing, ironing services, phone charging and other private businesses based on electronic devices. These help those to move from extreme poverty as demonstrated inside regions associated by a small scale grid organization in Ghana (Africa, 2019).

### 2.3 Research gap

Current literature made by different researchers had only evaluated accessibility to grid electricity services and micro enterprise development, drivers and obstructions to rural electrification, influences of access to electrical energy to rural enterprises. However, their research did not cover entire continent towards women empowerment in family unity through electricity access especially in Sub-Saharan Africa countries like Uganda, Kenya, Rwanda, and others. little has been done to identify the impact of electrification to the women empowerment in rural family units. Therefore, this study on Uganda attempts to channel such knowledge gap in literature and it will consider women’s empowerment as a procedure towards gender equality, hence this will be a concept that requires analytic consideration regarding to females and males.

### 2.4 Theoretical framework

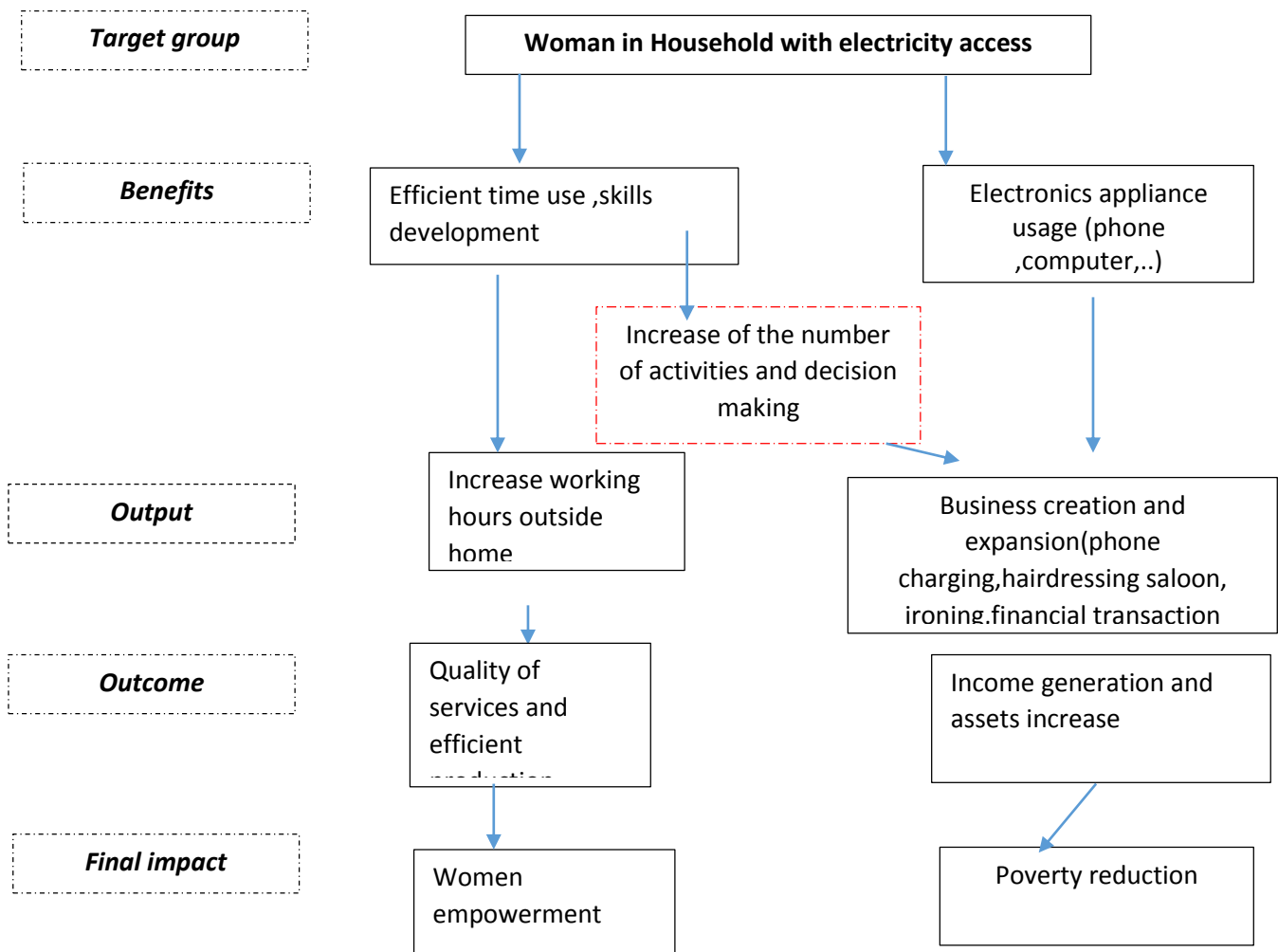


Figure 1 Theory of Change from Electricity access to Women empowerment



**Table 1: Mean values attributes of electricity users and non-users in rural Uganda**

Variables	2010-2011		T-test	2011-2012		T-test
	users	non-users		users	non-users	
Household assets/USD	45420	7283	-7.63	28710	5727	13.26
Total household income/USD	3536	1137	-6.96	3914	805	15.63
No formal education for female	0.16	0.17	0.15	0.20	0.17	-1.27
hours in domestics activities	15.21	16.55	1.41	14.95	14.46	-0.63
hours in fetching water	1.32	5.18	7.89	1.28	3.70	7.92
hours in farming activities	1.72	8.71	7.86	1.88	10.02	10.37
hours in firewood collection	0.17	2.19	10.45	0.25	2.23	10.10
hours in food processing	0.00	0.54	3.43	0.20	0.78	3.97
contraception use	0.44	0.33	-2.96	0.43	0.31	-3.72
<b>Household characteristics Variables</b>						
Age of the hh head	41.17	43.25	2.04	43.85	47.66	4.17
Age of the woman in hh	35.41	37.59	2.33	38.56	42.69	4.35
HH size	7.41	7.77	1.40	8.15	7.76	-1.67
gender of household head	0.74	0.73	-0.36	0.72	0.69	-0.75
household location Urban or rural	0.73	0.15	20.55	0.68	0.14	23.94
What is [NAME]'s ethnic group/tribe?	25.89	34.84	7.35	25.89	34.84	7.35
number of children born	3.32	5.09	6.99	2.71	4.15	6.38
<b>sub total</b>	<b>189</b>	<b>1366</b>		<b>302</b>	<b>2158</b>	
<b>Total</b>		<b>1555</b>			<b>2460</b>	

Tables 1 present Mean values attributes of electricity users and non-users in rural Uganda for all waves (2010/11 and 2011/12) and Average values of the key variables respectively used in this study. As shown in table it provides more details descriptive statistics of household characteristics (Age of the household Head, age of Woman/wife within the household, Household size, Gender of the household head, Household location Urban/rural and the number of Dependence) and outcomes variables (Household assets, Household income, Formal education for female, Number of hours spent in home activities, Number of hours spent on fetching water, Number of hours spent on farming activities, number of hours spent in firewood collection and lastly Contraception use adopt). In wave 1 the average of the age of household was 41 for non-users of electricity and 43 for users while in wave 2 the average for users was 43 and for the non-users was 47; this illustrates that an increase in age of the head of the household will lead to a decrease of access to electricity. Same way for the age of woman or

wife within the Household in wave one for electricity users the average was 35 and 37 for non-users while in wave two the average was 38 for electricity users and 42 for non-users. dependence is the ration between household size over the number of children born within the Household it shows that the average number of dependence will increase by 0.5 point percentage and by 0.69 point percentage in wave one and for wave two it will increase by 0.38 point percentage in electricity users household and by 0.54 point percentage in non-users, it illustrates that having access electricity will depend on less number of dependants within the Household. Women who live in households in urban regions are more likely to use electricity as show in wave one the chance of access to electricity living in urban areas has increased by 0.73 point percentage and by 0.15 for non-users which is the same case in wave two where the chance of access to electricity living in urban areas has increased by 0.68 point percentage and 0.14 point percentage for non-users of electricity. Women who live electrified households are more likely to have both higher total household income and total household assets value, total average annual income in wave 1 for electricity users' households is higher (3536USD) and lower for electricity non users (1137USD) and in wave 2 for electricity users the average of asset value is (3914USD) while in non-users it is (805USD).For Assets to the electricity users Household in wave one the average of value of asset is (45420USD)and (7283USD) for non-users. Women are more likely to have no formal education if they have no access to electricity as shown it he table it has increased by 0.16 point percentage for electricity users and by 0.17 point percentage for electricity non users .The number of hours working in different home activities such as fetching water ,firewood collection, food processing and other domestics activities women in electricity users spends less hours than the ones in non- electricity users because they spend more time in some other income earning activities. women are slightly more likely to use contraception in wave one by 0.44 point percentage if they reside in households with access to electricity and by 0.33 point percentage if they have no access to electricity w, the same in wave the users the probability of using contraception will increase by 0.43 point percentage while for non-users will increase by 0.31.



## CHAPTER FOUR: RESULT AND DISCUSSIONS

The result from table 2 to table 4 as well as all figure describe the Equation(1) results, the results are summarized into 3 parts first is electricity access on household assets and income in (4.1) ,second is Electricity access and time allocation in (4.2) which presents the number of hours spent in home activities, fetching water(1) ,farming activities(2)firewood collection(3), food processing(4)and other domestic activities(5) association with electricity access using fixed effect as has been described in equation(1) and the third electricity access with contraception use in (4.3) which describe the association of electricity access and contraception method adopt.

**Table 2: Access to electricity, household assets and income**

VARIABLES	(1)	(2)
Household with electricity access (yes=1)	1.000*** (0.126)	0.898*** (0.109)
Age of household head	0.013*** (0.005)	-0.001 (0.005)
Age of spouse within household	0.009 (0.005)	-0.001 (0.005)
Number of Household member	0.151*** (0.010)	0.125*** (0.009)
Gender of the household head	0.577*** (0.090)	0.042 (0.076)
Formal education for women(no formal=1)	-0.186** (0.086)	-0.102 (0.078)
Location of the household(urban=1)	0.056 (0.105)	0.285*** (0.090)
Dependence	-0.263*** (0.081)	-0.122** (0.060)
Constant	5.183*** (0.158)	5.015*** (0.137)
Survey year FE	YES	YES
Ethnicity FE	YES	YES
Observations	3,457	3,457
R-squared	0.256	0.199

Source: Author's computation based on UNPS data for (2010/2011) and (2011/2012)

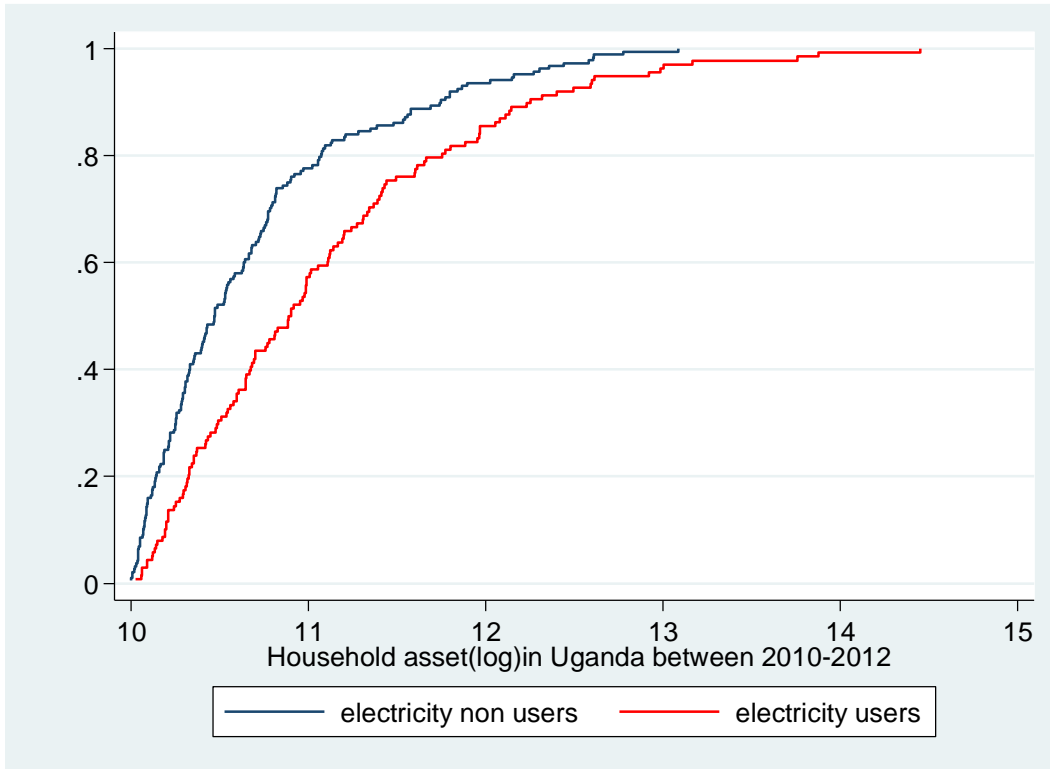
Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### **4.1 Access to electricity on household assets and income**

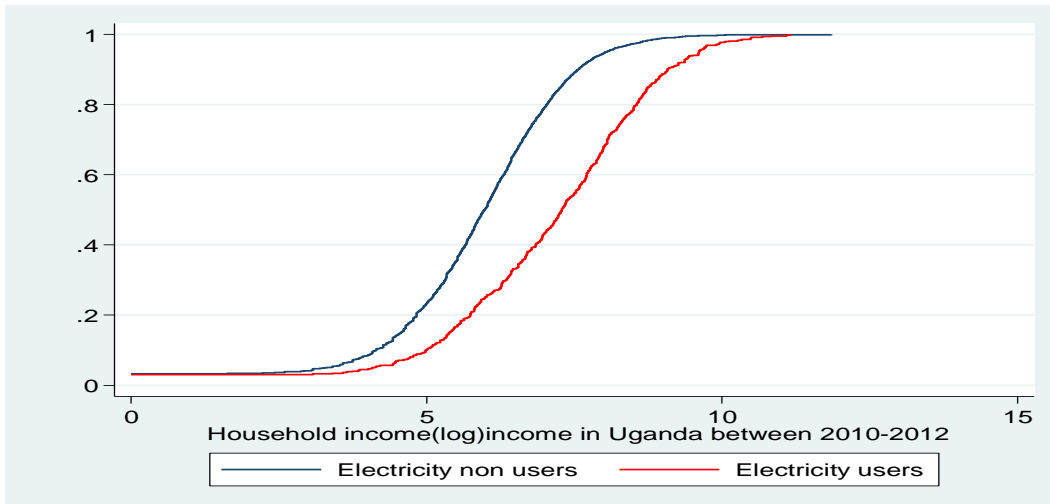
From table 3 reports that when the household use the electricity the total estimated value of all the assets owned by the household is increased by 100.0 points percentage and 89.8 points percentage increase in household's income, With one addition year on household head age is associated with significantly an increase of 1.3 point percentage in the total estimated value of asset but with the decline in the income for household by 0.1 point percentage while one additional year on the age of the spouse within the household is associated with an increase of 0.9 point percentage on the total household's asset with a decrease of 0.1 point percentage on the household's total income , also one unit increase on the total number of household members is associated with the significantly rise of 15.1 points percentage on the household's total asset with a significantly increase of 12.5 points percentage on the household's total income .

Not surprisingly, The household head with no formal basic education is associated with the decrease of 18.6 points percentage in total estimated value of the household's assets and is also associated with the decrease of 10.2 points percentage in the household's total income, If the household head is female there was a significantly increase of 57.7 points percentage on the household's total assets and is associated with an increase of 4.2 points percentage on the household's total income and hence this implies directly the women empowerment with in the household, as expected with the households living in the urban areas this was associated with the increase of 5.6 points percentage on the total estimated value of household asset and there was associate with a significantly increase of 28.5 points percentage on the household's total income. With an increase of one dependent on the household's dependence (the proportion of the number of children to the total household size) this is associated with a significantly decline of 26.3 points percentage on the household's total asset and this is also associated with a significantly decline of 12.2 points percentage in the household's total income.



*Figure 2: Cumulative probability distribution of annual asset and electricity access*  
*Notes: the cumulative distribution is drawn across all regions in Uganda using UNPS 2010-2012*

From the figure 2, we report the cumulative probability distribution of the total estimated annual asset and electricity access in Uganda. It shows that the electricity users have higher total annual assets compared to the electricity non-users.



*Figure 3: Cumulative probability distribution of annual income and electricity access*  
*Notes: the cumulative distribution is drawn across all regions in Uganda using UNPS 2010-2012*

From the figure 3, we report that the cumulative probability distribution of total income and electricity access in Uganda. It shows that the electricity users have higher income compared to the electricity non-users.

## 4.2 Access to electricity and time allocation in Uganda

With the Ethnicity and survey year fixed effects, there leftovers a strong restrictive link between period used up in some activities and furthestmost useful with income generating accomplishments and family unit electricity access status.

*Table 3: Electricity access and time allocation for woman in the household*

	(1)	(2)	(3)	(4)	(5)
Household with electricity access (yes=1)	-	-	-	-0.037**	-0.021
	0.372***	0.629***	0.351***		
	(0.049)	(0.070)	(0.034)	(0.018)	(0.066)
Age of household head	-0.002	0.004	-0.003	0.000	-0.002
	(0.002)	(0.004)	(0.002)	(0.001)	(0.003)
Age of spouse within household	-	-0.003	-0.002	0.000	-
	0.013***				0.010***
	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)
Number of Household member	-	0.033***	-0.008**	0.002	0.004
	0.035***				
	(0.005)	(0.008)	(0.004)	(0.003)	(0.006)
Gender of the household head	0.131***	0.106	0.156***	0.031	0.109**
	(0.046)	(0.068)	(0.036)	(0.026)	(0.052)
Formal education for women(no formal=1)	-0.098**	-0.034	-0.038	-0.058**	0.046
	(0.043)	(0.065)	(0.034)	(0.025)	(0.054)
Location of the household(urban=1)	-	-	-	-	-
	0.117***	0.798***	0.514***	0.061***	0.155***
	(0.044)	(0.063)	(0.033)	(0.021)	(0.054)
dependence	0.122***	0.183***	0.120***	0.010	0.237***
	(0.031)	(0.051)	(0.027)	(0.018)	(0.039)
Constant	1.925***	1.044***	1.006***	0.191***	2.700***
	(0.079)	(0.122)	(0.064)	(0.043)	(0.096)
Survey year FE	YES	YES	YES	YES	YES
Ethnicity FE	YES	YES	YES	YES	YES
Observations	3,457	3,457	3,457	3,457	3,457
R-squared	0.276	0.205	0.233	0.134	0.075

Source: Author's computation based on UNPS data for (2010/2011) and (2011/2012)

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 3 represents that, household consuming electric energy is accompanying with 2.1 point percentage decrease in hours spent by rural women on home activities, this electricity access for the household is associated with a decline of 37.2 point percentage in hours spent on fetching water and the household with electricity access was associated with a decrease of 62.9 percentage on hours spent in farming activities and the electricity access for the household was

associated with a decline of 3.7 point percentage in hours spent on food processing while the household with electricity access was associated with a decrease of 35.1 point percentage in hours allocated for fire woods collection, *ceteris paribus* hold. Our finding that electricity access is related with a generous decrease in time spent collection of firewood agree with those found by the other authors Heltberg (2003) and Heltberg (2004). As well, Dinkleman (2011) finds that electricity access in KwaZulu-Natal triggered a decline in the usage of wood for food preparation. From table 3 above represents that on more year additional on the age of household is associated with 0.2 point percentage decline in the hours spent on fetching water and this one year additional to the age of household is also associated with the increase of 0.4 point percentage on the time hours spent on farming activities and this one year additional is also associated with the decrease of 0.3 point percentage in the time hours spent on firewood collection and also associated with the decline of 0.2point percentage on the time hours spent in home activities while the one year additional to the age of household head has no effect on the time hours spent in food processing *ceteris paribus* hold. From table 3 reports that on more year additional on the age of spouse within household is associated with significantly decline of 1.3 point percentage decline in the hours spent on fetching water and this one year additional to the age of household is also associated with the decrease of 0.3 point percentage on the time hours spent on farming activities and this one year additional is also associated with the decrease of 0.2 point percentage in the time hours spent on firewood collection and also associated with a significantly decline of 1.0 point percentage on the time hours spent in home activities while the one year additional to the age of spouse within household has no effect on the time hours spent in food processing, *ceteris paribus* hold.

From table 3 reports that on more additional member on the total numeral of family unit members within household is associated with significantly decline of 3.5 point percentage decline in the hours spent on fetching water and this one additional member on the number of household members is also associated with the significantly increase of 3.3 point percentage on the time hours spent on farming activities and this one additional member on the number of household members is also associated with the significantly decrease of 0.8 point percentage in the time hours spent on firewood collection and also associated with an increase of 0.4 point percentage on the time hours spent in home activities while the one additional member on the number of household members has an increasing effect of 0.2 point percentage on the time hours spent in food processing, *ceteris paribus* hold. From table 3 reports that when household

is headed by female is associated with significantly incline of 13.1 point percentage decline in the hours spent on fetching water and this household which is headed by female is also associated with the increase of 10.6 point percentage on the time hours spent on farming activities and this household which is headed by female is also associated with the significantly incline of 15.6 point percentage in the time hours spent on firewood collection and also associated with a significantly increase of 10.9 point percentage on the time hours spent in home activities while the household which is headed by female has an increasing effect of 3.1 point percentage on the time hours spent in food processing , ceteris paribus hold.

From table 3 shows that when household headed has no formal basic education is associated with significantly decline of 9.8 point percentage decline in the hours spent on fetching water and when household headed has no formal basic education is also associated with the decrease of 3.4 point percentage on the time hours spent on farming activities and this household headed with no formal basic education is also associated with the significantly decrease of 3.8 point percentage in the time hours spent on firewood collection and also associated with an increase of 4.6 point percentage on the time hours spent in home activities while household headed with no formal basic education has a significantly increasing effect of 5.8 point percentage on the time hours spent in food processing, ceteris paribus hold.

From table 3 shows that when household lives in the urban location is associated with significantly decline of 11.7 point percentage decline in the hours spent on fetching water and when household lives in the urban location is also associated with the significantly decrease of 79.8 point percentage on the time hours spent on farming activities and this household living in the urban location is also associated with the significantly decrease of 51.4 point percentage in the time hours spent on firewood collection and also associated with a significantly decrease of 15.5 point percentage on the time hours spent in home activities while household living in the urban location has a significantly decreasing effect of 6.1 point percentage on the time hours spent in food processing , ceteris paribus hold.

From table 3 shows that one more additional dependent on household dependence in the urban location is associated with significantly increase of 12.2 point percentage decline in the hours spent on fetching water and when one more additional dependent on household dependence is also associated with the significantly increase of 18.3 point percentage on the time hours spent on farming activities and this one more additional dependent on household dependence is also associated with the significantly increase of 12.0 point percentage in the time hours spent on firewood collection and also associated with a significantly increase of 23.7 point percentage

on the time hours spent in home activities while one more additional dependent on household dependence has a significantly increasing effect of 1.0 point percentage on the time hours spent in food processing, ceteris paribus hold.

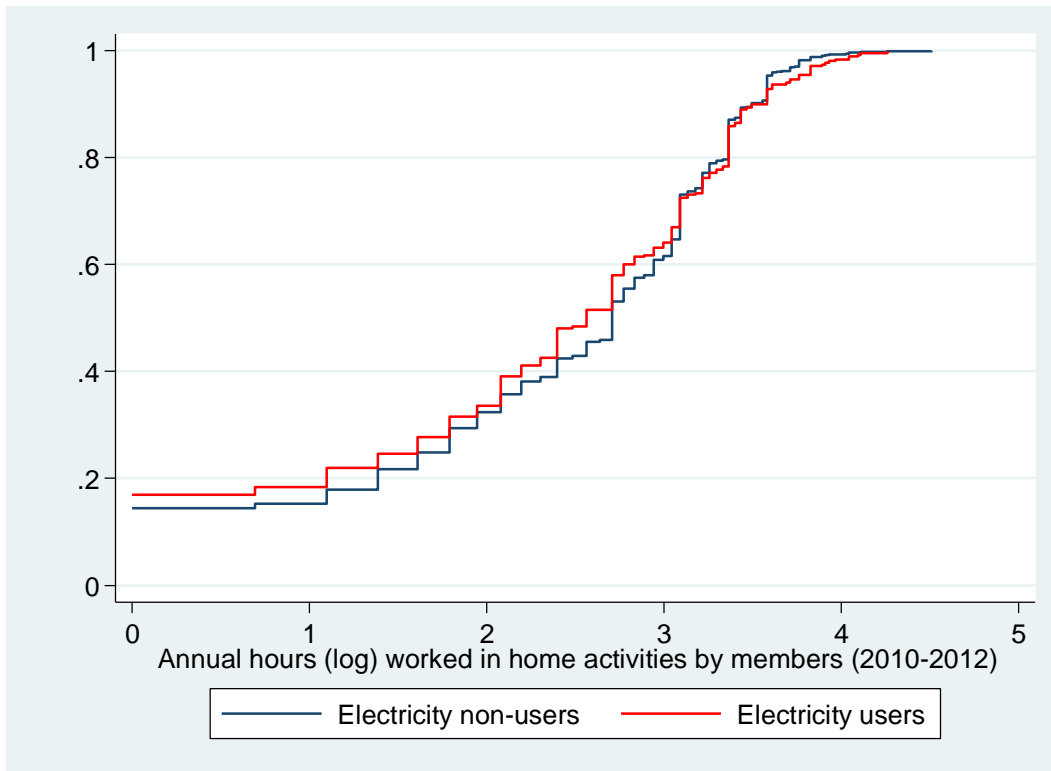


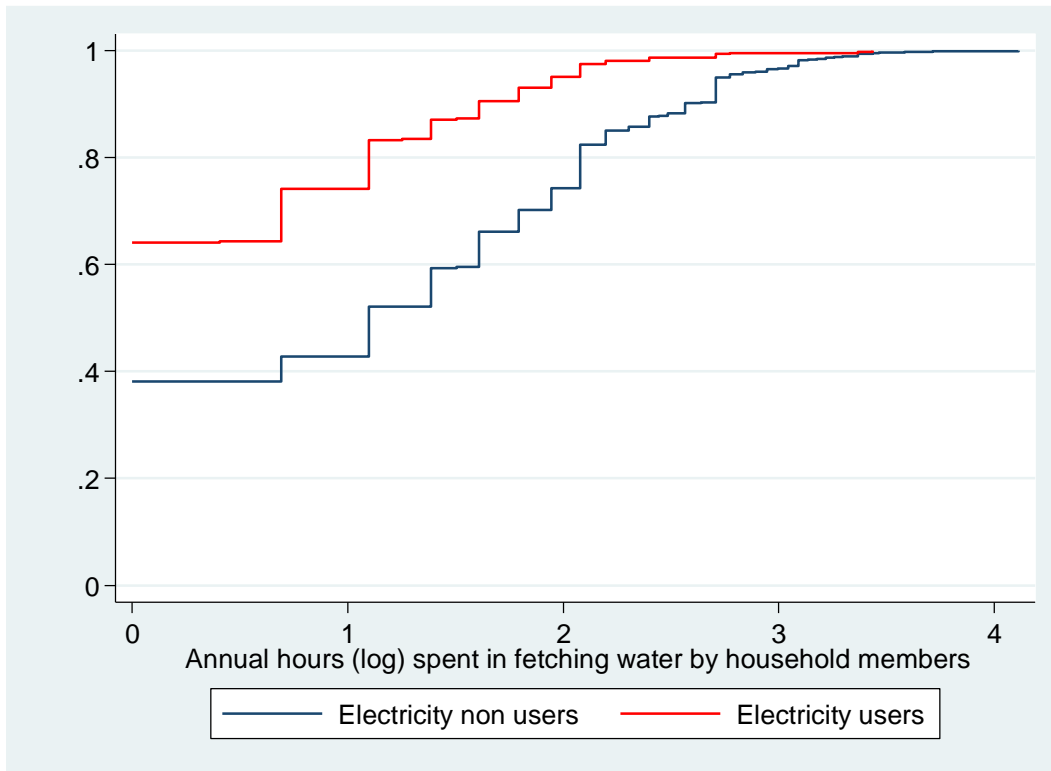
Figure 4: Cumulative probability distribution of annual hours spent in home activities and electricity access

Notes: the cumulative distribution is drawn across all regions in Uganda using UNPS 2010-2012

From Figure 4. We represent the Cumulative probability distribution of annual hours spent in home activities and electricity access in Uganda. It shows that the electricity users spent few hours in home activities compared to electricity non-users , it make sense as women in the households with access to electricity will not focus only in domestics activities such as cooking, raising kids,.. she will be able to go and work outside home in other generating income activities like hairdressing, phone charging, she will also benefits having electricity in her home and find time to do extra hours and educating her children, by using phone and television she will get information easily and find time for leisure and relaxation which will allow good communication ,it will also save time for young ladies and ladies to seek after scholastic open doors as evidently the advancement of lady in Africa is altogether hindered by the overburden of home accomplishments The additional time could then be spent grinding away through



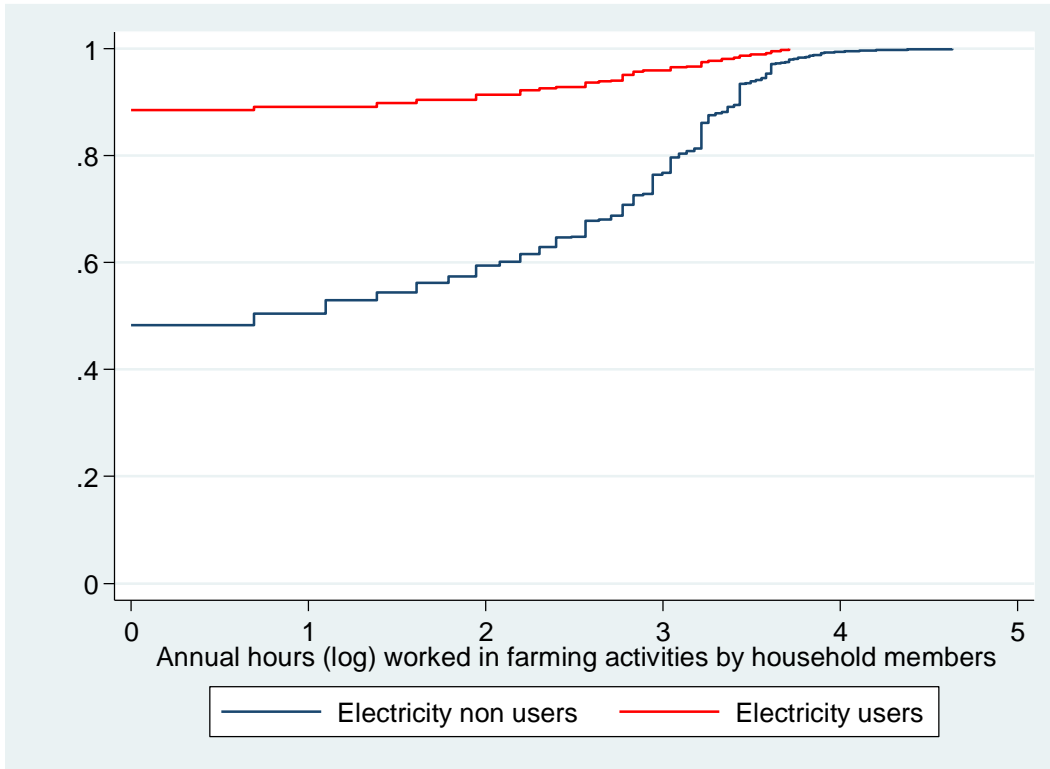
independent work or job creation where in between 20 hours and 54 hours spent in home activities the cumulative probability of both electricity users and non-users coincide and this means that the probabilities look the same for both,



*Figure 5: Cumulative probability distribution of annual hours spent in fetching water and electricity access*

*Notes: the cumulative distribution is drawn across all regions in Uganda using UNPS 2010-2012*

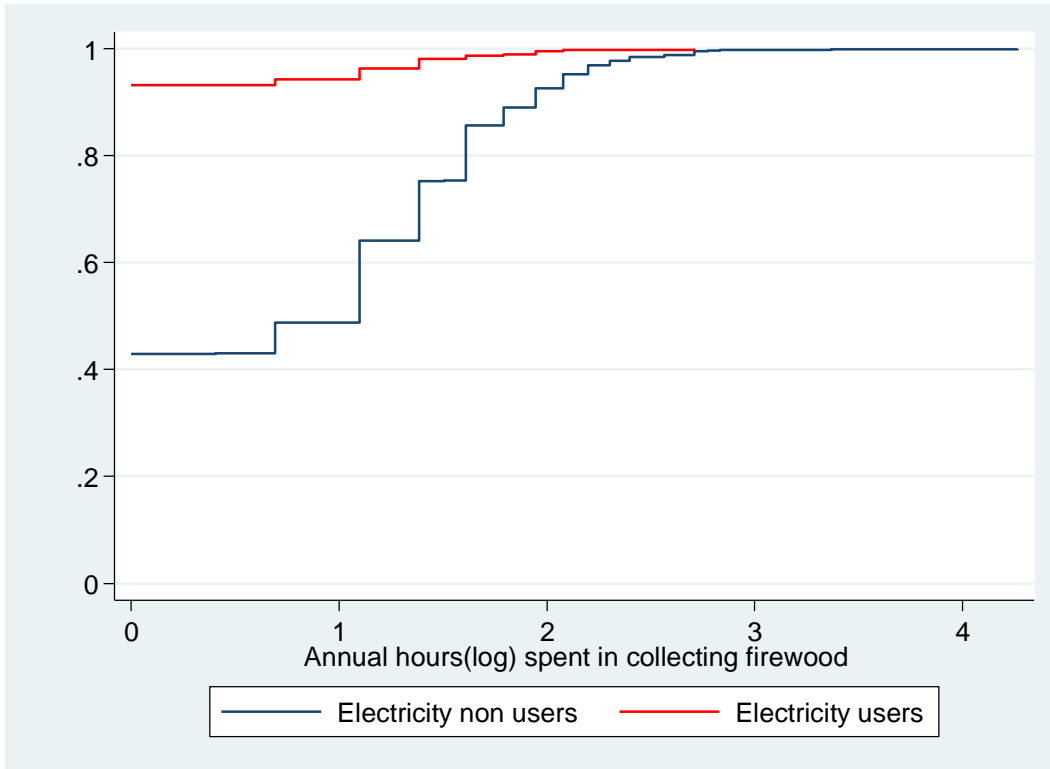
Figure 5 we represent Cumulative probability distribution of annual hours spent in fetching water and electricity access in Uganda. It delivers that the electricity users spent fewer hours in fetching water compared to the electricity non-users where at 33 hours spent in fetching water the cumulative probability for both electricity users and electricity non-users coincide and this means that the probabilities look the same for both.



*Figure 6: Cumulative probability distribution of annual hours spent in farming activities and electricity access*

*Notes: the cumulative distribution is drawn across all regions in Uganda using UNPS 2010-2012*

Figure 6 represent the Cumulative probability distribution of annual hours spent in farming activities and electricity access in Uganda. It indicates that the electricity non-users spent more hours in farming activities compared to the electricity users .



*Figure 7: Cumulative probability distribution of annual hours spent in collecting firewood and electricity access*

*Notes: the cumulative distribution is drawn across all regions in Uganda using UNPS 2010-2012*

Figure 7 represent the Cumulative probability distribution of annual hours spent in collection of firewood and electricity access in Uganda. It indicates that the electricity non-users spent more hours in firewood collection compared to the electricity users where at 20 hours spent in firewood collections both cumulative probability for electricity users and electricity non-users coincide and this means that the probabilities look the same for both. all of these variables we use in this study about time allocation show how a lady in the family unit with access to electricity can be strengthened by spending less hours in home activities and find time to work in other generating income activities which will lead to her economic development, to her household member as well as to her community.

### 4.3 Electricity access and contraception use

**Table 4: Electricity access and contraception use**

	(1)
Household with electricity access (yes=1)	0.074** (0.032)
Age of household head	-0.005*** (0.001)
Age of spouse within household	-0.004*** (0.001)
Number of Household member	0.009*** (0.003)
Gender of the household head	0.103*** (0.024)
Formal education for(no formal=1)	-0.028 (0.022)
Location of the household(urban=1)	0.089*** (0.026)
Dependence	0.086*** (0.018)
Constant	0.486*** (0.043)
Survey year FE	YES
Ethnicity FE	YES
Observations	3,092
R-squared	0.112

Source: Author's computation based on UNPS data for (2010/2011) and (2011/2012)

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

From table 4 represents correlation between access of electricity and use of contraception the results of our study have highlighted the likelihood of contraception use among electricity users' vs. non electricity users. This could be explained by the access to health information from mass media (TV, Radios...) in addition to other public health education provided to general population where non-electricity users belong. This was also further described in the Rwanda Demographic and Health Survey (RDHS-2015) showing mass media as a positive factor towards contraception use. The woman within household with electricity access is more like to use contraception method hence the reduce dependence (proportion of number of children to the total household size) since the high dependence leads to the increased numeral total hours over by that woman in different activities especially in-home activities.

From table 4 represents that one more year additional on the age of household head is associated with a significantly less likelihood to use contraception method by 0.5 point percentage, and

the one more year additional on the age of spouse within household is associated with a significantly less likelihood to use contraception method by 0.4 point percentage, whereas one additional member on the household members within household is associated with a significantly more likelihood to use contraception method by 0.9 point percentage, worthwhile the household which is headed by a female is associated with a significantly more likelihood to use contraception method by 10.3 point percentage, but also when the household head has a formal basic education is associated with a less likelihood to use contraception method by 2.8 point percentage , while when the household lives in the urban location is associated with a significantly more likelihood to use contraception method by 8.9 point percentage and one additional dependent on the household dependence is associated with a significantly more likelihood to use contraception method by 8.6 point percentage hence the above outcomes give proof that accessing power positively affects all indicators for women's empowerment, *ceteris paribus* hold.

## **CHAPTER FIVE: CONCLUSION AND RECOMMENDATION**

This study examines at the causal connection between admittance to electricity and women' strengthening utilizing an enormous gender disaggregated panel data collection from the Uganda. It shows that women in the households with access to electricity will not focus only in domestics activities such as cooking, raising kids, etc she will be able to go and work outside home in other generating income activities such as hairdressing, phone charging, ironing services, etc she will also benefits having electricity in her home and find time to do extra hours and educating her children, by using phone and television she will get information easily and find time for leisure and relaxation which will allow good communication between household members ,it will also save time for young ladies and ladies to seek after scholastic open doors as evidently the advancement of lady in Africa is altogether hindered by the overburden of home accomplishments The additional time could then be spent grinding away through independent work or job creation which will lead to her economic development, to her household member as well as to her community. Women empowerment is essential in our community because when is empowered the society will be empowered. As recommendation this study suggests to consider woman within Household by providing electricity because there will be a big change after as seen in our results.

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**SUBMISSION CHECKLIST FOR MASTERS THESIS SUBMISSION: OCTOBER 2020**

Project Title: **Rural Electrification and Women Empowerment in Uganda:  
Evidence from Micro-data**

Names of student: Josee UMUGWANEZA

Student Number: **219014812**

Program of study: MASTERS OF SCIENCE IN ENERGY ECONOMICS

SN	List of components to be checked	Comment from supervisor
1	Comments raised by panel during research proposal were fully addressed	YES
2	All UR postgraduate thesis writing guidelines were followed	YES
3	Plagiarism has been checked and proper citation was made. Similarity index has been checked and is within acceptable percentage ( <b>Not more than 24%</b> ).	YES
4	Please indicate the level of similarity index	16%

**Names of approving supervisor and signature:** Dr. Aimable NSABIMANA



**Date of approval: 03 November,2020**