IMPACT OF RURAL ELECTRIFICATION ON SMALL SCALE ENTERPRISES IN ZOMBA

MASTER OF ARTS (DEVELOPMENT STUDIES) THESIS

By

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DECLARATION

I, the undersigned, declare that this thesis is my own work and has not been submitted to any other institution for similar purposes. Where other people's work has been used, acknowledgement has been duly given. I am solely responsible for all errors contained herein.

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CERTIFICATE OF APPROVAL

The undersigned certify that this thesis represents the student's own work and effort and has been submitted with our approval.

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DEDICATION

To my dearest parents, Sophie and Ajida, for believing so much in me.

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God has been faithful to me and without Him I would not be where I am today. His constant Grace has lifted me up in my darkest moments and has enabled me to experience His wonders. Glory be to Him always.

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ABSTRACT

Lack of quantitative evidence has raised debates on the extent of rural electrification's impact on small scale enterprises. This study therefore assessed the impact of rural electrification on small scale enterprises in Jali (electrified) and Gomani (non-electrified) Trading Centres. The study used cross sectional data collected from 90 enterprise owners and 4 key informants through a semi structured questionnaire and a key informant guide, respectively. Key indicators for small scale enterprises included type of enterprises, profits and daily operating hours. The results showed that electricity connectivity was significantly correlated with the type of enterprise, profits and daily operating hours. There was also evidence of existing gender differences in daily operating hours in electrified enterprises. Holding all factors constant, further tests were done to compare the sample groups using the key indicators. The Wald Tests showed no significant differences in profits and daily operating hours between electrified and non-electrified enterprises in Jali and between non-electrified enterprises in Jali and Gomani. The Tests' results further showed that there were significant differences in profits and daily operating hours between electrified enterprises in Jali and non-electrified enterprises in Gomani. The conclusion drawn from the study results is that rural electrification has an influence on small scale enterprises. The policy implications include: encouraging electrified enterprise owners to utilize credit loans to boost their capital and providing them with business training to enhance their business skills and fully utilize electrification opportunities in small scale enterprises.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

CEDPA	Centre for Development and Population Activities
DFID	Department For International Development
DEA	Department of Energy Affairs
EPF	Energy Policy Framework
ESMAP	Energy Sector Management Assistance Program
ESCOM	Electricity Supply Corporation of Malawi
IHS 3	Integrated Household Survey 3
INSP	International Network on Strategic Philanthropy
ISP	Infrastructure Services Project
JICA	Japanese International Co-operation Agency
MAREP	Malawi Rural Electrification Programme
MGDS II	Malawi Growth and Development Strategy II
MK	Malawi Kwacha
MPRSP	Malawi Poverty Reduction Strategy Paper
NSO	National Statistical Office
SSEs	Small Scale Enterprises
T/A	Traditional Authority

CHAPTER ONE

INTRODUCTION

1.0 Background

Small Scale Enterprises (SSEs) contribute so much to development (DFID, 2000). By definition, these are enterprises with less than 100 employees and include micro, small and medium sized enterprises (Meadows, Riley, Rao and Harris, 2003 and FinMark Trust, 2012). The assertion that SSEs contribute to development is substantiated by various studies undertaken at global, regional and local levels which have revealed that SSEs create employment, promote rural development, alleviate poverty and enhance economic development (DFID, 2000). In the developing world, SSEs employ a significant share of the workforce and generate a significant share of household income, particularly in low-income households (Chen, 1997). For instance, FinMark Trust (2012) reported that 5.7 million people in Zimbabwe are working in the sector, 2.8 million people as business owners and 2.9 million people as employees. In Malawi, these enterprises created employment for about 863 038 people in rural areas. Based on the FinScope Malawi study done in 2012 by FinMark Trust, findings indicated that SSEs generated income for most rural people as there were about 642 685 business owners and 220 353 people as employees.

Overall, entrepreneurs face a wide variety of challenges in operating their enterprises and these hinder business growth evidenced by low productivity and high rates of enterprise failure (Bowen, Morara and Mureithi, 2009). Lack of access to infrastructure, credit, markets and competition have commonly been cited in the literature as factors which stand in the way of SSEs development and performance. One example of such infrastructure is electricity (Attigah and Mayer-Tasch, 2013). Interestingly, FinMark Trust (2012) reported similar findings for rural small business owners in Malawi. They identified access to infrastructure and connectivity as a challenge that these business owners faced and illustrated that only 7% of small businesses in rural areas had electricity connection. Rural electrification would therefore help address this problem for rural SSEs.

Rural electrification adds value to income generating activities such as SSEs in which most rural men and women are involved (Fishbein, 2003; Mapako and Prasad, 2008; World Bank, 2008; Maleko, 2005 and Mustonen, 2008). In Malawi, this is also supported by current plans through the Malawi Growth and Development Strategy (MGDS II) to promote business enterprises (Malawi Government, 2011). Electrification is therefore one of the factors which may have both direct and indirect impacts on enterprise development (Maleko, 2005 and World Bank, 2008). There are many enterprises which owe their existence to the availability of electricity. Evidence drawn from a study conducted in Tanzania showed that the development of microenterprises which later brought significant changes in the social status of entrepreneurs was a product of electricity (Maleko, 2005).

Similar trends were also observed in Bangladesh (Bose, Uddin, and Mondal, 2013), Bolivia, Tanzania and Vietnam (Kooijman-van Dijk and Clancy, 2010), Zimbabwe (Mapako and Prasad, 2008), Kenya (Kirubi, 2006) and Nigeria (Akpan, Essien and Isihak, 2013). If one wishes to subscribe to the ongoing debate that rural electrification has an impact on rural enterprises, how does it support enterprise activity?

1.1 Institutional and Policy Framework

Existing policy documents, the MGDS II and the Malawi Poverty Reduction Strategy Paper (MPRSP) support rural electrification which is central to transforming rural communities into potential drivers of economic growth and development to allow them to exploit the socioeconomic opportunities and tackle challenges for improving their livelihoods (Government of Malawi, 2011).

Rural Electrification in Malawi started way back in 1980 with the Electricity Supply Corporation of Malawi (ESCOM) as the implementing agency through donor and own funding. In 1995, the mandate to run rural electrification was given to the Department of Energy Affairs (DEA) (Malawi Government, 2010) and by then ESCOM had already completed Phases 1 to 3 of the programme. The Malawi Rural Electrification Programme (MAREP) has the objective of stimulating economic development and rural transformation for poverty reduction as per the mandate in the Energy Policy Framework (EPF) of 2003. Besides the EPF, MAREP has the backing of MGDS I and II of 2006-2011 and 2011-2016 as well as the Rural Electrification Act, Number 21 of 2004 which

provide the policy and legal framework, institutional arrangement and a regulatory mechanism to embark upon that initiative in the country.

DEA targets trading centres which have the potential of bringing out financial stamina necessary for economic growth to enable effective implementation of rural electrification. This is done in phases. In Phase 4, DEA received funding from the Japanese International Corporation Agency (JICA). Since taking over from ESCOM, DEA has been electrifying trading centres across the country and is currently implementing Phase 6 targeting 3 trading centres per district (Department of Energy Affairs, 2012). After implementation and installation of grid materials, ESCOM takes over to ensure payment for electricity services provided in these trading centres. Besides benefitting from MAREP, some trading centres have also benefitted from Infrastructure Services Project (ISP) initiated by the Ministry of Economic Planning and Development. ISP has the overall objective of improving household welfare and strengthening economic growth in market centres and surrounding rural areas within the project area through the provision of core infrastructure services (World Bank, 2013).

Electricity came into Jali area in the late 1960s but this was not part of rural electrification hence only a privileged few had access to it. The effort of individuals to have electricity connection accelerated the coming in of grid electricity lines in the area. Between 1960 and 2000, there was gradual inception of electricity as such only a few enterprises were using electricity. In 2006, the Government of Malawi took over through the ISP to improve electricity, roads and water services in Jali. The project started in

2006 and by 2010, maintenance in all the areas mentioned was complete (World Bank, 2013).

1.2 Problem Statement

Rural electrification supports all enterprises, small and large, owned by males, females or mixed sex (World Bank, 2008). One interesting development is that most rural people are involved in income generating activities such as small scale enterprises (FinMark Trust, 2012). Rural electrification adds to these activities by contributing to growth in productivity in terms of reducing production costs, increasing ability to produce goods and services and increasing income (Cook, 2011). Various studies have shown that rural electrification increased employment and the number of enterprises in Matebeleland, Zimbabwe (Mapako and Prasad, 2008). A similar trend was also observed in the remotest areas of South Africa where enterprise activity increased by 40% due to rural electrification (Prasad and Dieden, 2007).

Despite the growing importance of electricity as a catalyst for rural SSEs (DFID, 2000; Mustonen, 2008 and World Bank, 2008), Attigah and Mayer-Tasch (2013) observed that quantitative evidence hardly exists. The result is that most references to this topic are limited to general statements about the capacity for impact that rural electrification can have on productive uses, income generation and associated enterprise development. The difficulty therefore lies in singling out the impact of rural electrification. Bose et al. (2013) observed that there are few impact studies of rural electrification on small scale

enterprises due to inherent difficulties of conceptualizing and measuring impact and this has raised debates on whether a direct impact exists.

Studies reporting positive impacts lacked a reliable methodology as such the outcomes could not be quantified (Willcox, Waters, Wanjiru, Pueyo, Hanna, Palit, Sharma, 2015). Little attention was also paid to the comparative analysis component which forms the basis of quantitative studies. For instance, studies by Maleko (2005) and Mapako and Prasad (2008) overlooked the comparative analysis component of enterprises connected and not connected to electricity to estimate the impact of rural electrification. In the context of the aforementioned literature, evidence of its contribution is often presented in form of simple correlations between electricity and welfare indicators and these correlations do not imply causality (Attigah and Mayer-Tasch, 2013). What is missing from these studies is an adequate assessment of its impact using regression analysis which tests the magnitude and direction of causal relationships between variables.

Due to lack of literature on the same in the country, the study therefore filled this gap by generating information to assess the impact of rural electrification on small scale enterprises. The questions addressed in this paper included: What enterprises are associated with rural electrification? Has electricity contributed to increase in profits? Does electricity increase daily operating hours? Are there any significant differences in the type of enterprises operated by males or females? Are the profits the same in male and female owned enterprises? Are daily operating hours the same in male and female owned enterprises?

1.3 Objectives

The general objective of the study was to assess the impact of rural electrification on small scale enterprises in Zomba. Specifically, the study sought to:

i. Identify the type of enterprises associated with rural electrification;
ii. Estimate the effect of rural electrification on profits;
iii. Estimate the effect of rural electrification on daily operating hours;
iv. Assess the gender differences in the role of rural electrification.

1.4 Hypotheses

The following were the study hypotheses:

i. There is no association between the type of enterprise and rural electrification;
ii. Rural electrification has no significant effect on profits;
iii. Rural electrification has no significant effect on daily operating hours; and
iv. There are no significant gender differences in the role of rural electrification.

1.5 Significance of the Study

This study has explored the impact of rural electrification on SSEs and analyzed factors besides electrification which affect these enterprises. The study has also assessed components which were overlooked in previous studies such as the positive externality which is the effect that arises from the treatment of other individuals in the same cluster and the total impact of rural electrification. Besides contributing to literature on the same in the country, the results obtained provide valuable insights to drive policies and programmes that promote rural electrification. Additionally, with the increasing importance of gender in business circles, the study has assessed the magnitude of

electrification's role on male and female owned enterprises in terms of the type of enterprise being operated, profits and daily operating hours as these were overlooked in the previous studies.

1.6 Organization of the Report

The rest of the thesis is organized as follows; Chapter Two presents theoretical and empirical literature that centre around change and profitability in SSEs. Chapter Three outlines the research design and methodology used in the study. Chapter Four discusses the study findings and Chapter Five gives the conclusion, policy implications and areas for further research.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter presents a review of both theoretical and empirical literature on change and profitability in SSEs and the conceptual framework guiding the study. One assumption underpinning all the theories discussed in this chapter is that performance of SSEs largely depends on the level of profits they are making. Another assertion proposed in the literature is that rural electrification transforms rural enterprises; however, can the magnitude of its impact be attributed to electrification? Does electricity bring any change to the profits made in these enterprises? Can changes observed in profits, daily operating hours and type of enterprises being operated be due to electricity? There are various theoretical explanations in the literature but the study focused on the theories of change and theories of the firm.

2.1 Theoretical Literature

2.1.1 Basic Theories of Change

Most interventions are aimed at bringing a change to the targeted population but the question remains on whether changes in well-being are indeed due to the intervention(s) and not to other factors (Khandker, Koolwal and Samad, 2010). Under the basic theory of

change, issues of change take centre stage (INSP, 2005). The principal aim of this theory is to explain changes that can be attributed to a particular intervention (Organizational Research Services, 2004). This involves articulating the assumptions about the process through which change will occur and specifies the ways in which all of the required early and intermediate outcomes related to achieving the desired long-term change will be brought about and documented as they occur (Anderson, 2005). Anderson's description suggests that the theory can be applied either during the design or evaluation stage of an intervention.

At design stage, theories of change are used to develop meaningful change indicators to monitor program implementation (USAID, 2010). During the evaluation stage, Blamey and Mackenzie (2007) illustrated that the changes brought by the intervention are captured in a logic model or results chain. They further explained that besides focusing on the assumptions, risks and mechanisms associated with each link in the logic model, the model also focuses on the external factors that may influence the expected results and any empirical evidence supporting the assumptions, risks and external factors. As applied to this study, the assumption is that there might be some underlying factors besides electricity which can influence the type of enterprise, profits and daily operating hours in small scale enterprises. The theory therefore provides justification to examine some underlying factors that might explain any changes accrued to small scale enterprise owners in type of enterprises being operated, profits and daily operating hours because of electricity.

2.1.2 Refined Theories of Change

According to Organizational Research Services (2004), refined theories of change go beyond the basic theory to identify the assumptions behind the various causal links in the results chain and the risks associated with those assumptions. These assumptions help explain what conditions have to exist for each link to be realized as for A to lead to B. Since the basic theory of change is more about getting qualitative than quantitative evidence, the challenge as observed by USAID (2010) is that of measuring the expected results from an intervention and attributing those results to the activities of the intervention. Under such circumstances, Leeuw, Gilse and Kreft (1999) proposed that a list of premises instead of qualitative assumptions can be developed as these can be tested. This brings in the concept of measuring the degree of influence that an intervention has over these assumptions and risks. However, as noted by Stern et al. (2012), stated impacts are difficult to measure and possibly intangible.

To identify this degree of influence therefore, a new level of influence, a control group is introduced to denote areas where the intervention should be able to effectively control a particular condition such as the production of outputs (Organizational Research Services, 2004). In addition, significant external factors believed to have an effect on the intervention are identified (Organizational Research Services, 2004) with the aim of reducing uncertainty about the contribution the intervention is making (Stern et al., 2012). These influencing factors include situations or events that are outside the direct control of the intervention to influence, manage and prevent. Refined theories therefore

provide justification for the inclusion of a control group and getting evidence to determine the degree of the influence of electricity on SSEs in the study.

2.1.3 Theory of the Firm

Most discussions on performance and growth of firms revolve around the theory of the firm. It has been observed that some studies emphasize that the performance and growth of firms depends on well-developed human resources (El-Hamidi, 2011; Unger, Rauch, Frese and Rosenbursch, 2011; and Baum, Locke and Smith, 2001), and skills in entrepreneurial and resources management (Penrose, 2009). The aim behind such emphasis is profit maximization (Chrystal and Lipsey, 1997). This forms the core of the theory of the firm. The theory basically describes the behavior of a firm in pursuit of profit maximization analyzed in terms of input, the production technique employed, other quantity it produces and the prices it charges (Hall and Lieberman, 2006). According to Lipsey and Chrystal (2011) two assumptions drive the theory, "all firms are profit-maximizers, seeking to make as much profit for their owners as is possible. Each firm can be regarded as a single, consistent decision-taking unit." This implies that the desire to maximize profits drives all decisions made within a firm. In light of this view, firms generate outputs to a point where the marginal cost equals the marginal revenue and this is what distinguishes profit maximizing firms from non-profit maximizing ones (Sautet, 2000).

Hall and Lieberman (2006) argued that in their pursuit of maximum profit, firms face two constraints which relate to the demand curve and the costs. The demand curve constraint indicates the maximum price the firm can charge to sell any amount of output and this determines its revenue at each level of production. The costs constraint suggests the

increase in costs associated with the increase in output. One approach to choosing the optimal level of output as proposed by Hall and Lieberman (2006) is to measure profit as the difference between total revenue and total cost at each level of output, and then select the output level at which the profit is greatest. Another way of doing it is to use factors of production to a point where the marginal revenue is equal to marginal cost (Lipsey and Chrystal, 2011). The theory of the firm therefore provides some insight into what drives SSEs and provides motivation to examine if use of electricity in business has any effect on profits in this study. Based on insights from basic theory of a firm, performance of a small scale enterprise is directly linked to the level of profits made such that the enterprise will continue operating where marginal revenue equals marginal cost. This is more likely to happen when enterprise owners minimize cost of operation and strive to identify and address factors that would contribute to loss of profits in their businesses. Electricity is perceived to reduce cost of production, and in this case if enterprises acquire more revenue, they are bound to realize maximum profits.

2.2 Empirical Literature

This section provides a brief review of relevant literature from various studies on rural electrification to understand its contribution on SSEs. As earlier discussed in Section 1.3 the problem with these studies is the issue of attribution. According to Stern, Stame, Mayne, Forss, Davies and Befani (2012), attribution involves a causal claim about the intervention as the cause of impact and measurement of how the impact can be linked to the intervention. The emphasis on attribution suggests a direct link between a cause and an effect. Only one study discussed in the section by Akpan et al (2013) used regression analysis to provide statistical evidence of electrification's impact on SSEs.

2.2.1 Rural Electrification and SSEs

Most rural people are involved in income generating activities such as SSEs (FinMark Trust, 2012). Rural electrification adds to these activities by contributing to growth in productivity in terms of reducing production costs, increasing ability to produce goods and services and increasing income (Cook, 2011). He further argued that the causality between electricity and income may be in both directions where changes in income lead to changes in the demand for electricity and another scenario where electricity brings changes in the levels of income. This view was shared by Fishbein (2003) who noted that higher income levels are correlated with electrification and higher income households are also likely to adopt electricity when it becomes available.

Although there is general agreement in the literature that electricity is a catalyst for rural small scale enterprises (DFID, 2000; Mustonen, 2008 and World Bank, 2008), the two are seldom studied together (Meadows et al., 2003). The result is that most references to this topic are limited to general statements about the capacity for impact that rural electrification can have on productive uses, income-generation and associated enterprise development. Most importantly, perhaps, is the observation by Cook (2011) who pointed out that the causal link exists even though few studies have been conducted to ascertain the link between rural electrification and enterprise development. In the end, the concept remains debatable.

Some studies have attempted to find the causal effect, for instance, Mapako and Prasad (2008) established that rural electrification increased the number and scope of enterprises

and employment in Matebeleland, Zimbabwe. Similar findings were reported by Prasad and Dieden (2007) who found that enterprise activity increased by 40% due to the coming in of electricity in the remotest areas of South Africa. However, they also observed that growth in income generating activities primarily resulted from businesses already connected to electricity. The underlying assumption is that electricity connectivity opens up opportunities for already established enterprises to diversify the nature of services provided.

Wamukonya and Davis (2001) found that electricity had no impact on income. Their study conducted in Namibia targeted home based enterprises whose activities included basket weaving, cake making and welding. They found that the share of households with home-based income was highest amongst households without electricity in Namibia. The assumption drawn from this study was that prices of products were on the higher side for household enterprises using electricity unlike for household enterprises not using electricity. This might explain why they did not experience an increase in income.

2.2.2 Rural Electrification and Type of Enterprises

Rural electrification is expected to stimulate development of new enterprises. For instance, in Nepal, Rana-Deuba (2001) reported that electrification contributed much to the establishment of bakeries, photo studios, grocery shops, agricultural and saw mills and small scale agricultural activities such as poultry, farming and goat keeping. Nonetheless, this assertion was qualitative and lacked quantitative backing articulating

the exact number of these enterprises before and after inception of electricity. Instead what was given was qualitative observation.

Similarly, an Energy Sector Management Assistance Program (ESMAP) study conducted in the Philippines across four provinces found that a variety of small retail and tailoring shops were greater in electrified than non-electrified areas (ESMAP, 2002). Findings indicated that 25% of the households in electrified areas were running a home business compared to 15% in non-electrified areas. A critique of the study, Kooijman-van Dijk and Clancy (2010) pointed out that there was no clear indication as to whether this was a result of electrification or because of more favourable socio-economic characteristics in the target area.

Empirical findings from regional studies showed that the impact was the same in countries such as Tanzania, Zimbabwe, South Africa and Kenya. Evidence from Tanzania showed that rural electrification led to the establishment of microenterprises especially in the remote areas (Maleko, 2005). This literally meant that employment opportunities grew for entrepreneurs and those employees managing the enterprises. A similar trend was also observed in Matebeleland, Zimbabwe. Mapako and Prasad (2008) found a tremendous increase in the number of employees and attributed this to the coming in of rural electrification. The findings indicated that the total number of employees among all respondents was 106 before and 285 and after rural electrification respectively indicating an increase of about 270%.

More convincing perhaps are findings by the same authors which revealed that 88 enterprises were established after inception of rural electrification. Interestingly, most of them were electricity based such as grinding mills and bottle stores in Matebeleland. Mapako and Prasad (2008) also showed that retailing was seen as the most profitable by a considerable margin, with agriculture and grinding mills also seen as comparatively profitable. Findings from the same study indicated that rural electrification contributed to the establishment of grinding mills implying that electricity driven enterprises are profitable.

Contrary to the findings discussed above was a study done in Kenya. In his study where he assessed the impact of modern energy on economically productive activities especially carpentry and tailoring microenterprises, Kirubi (2006) found that some areas experienced no increase in the number of enterprises with the coming in of electricity and argued that the presence of electricity alone does not necessarily motivate entrepreneurs to open up new enterprises. He concluded that a powerful synergy and interactive effect exist between access to electricity, markets and roads to facilitate the desired growth of small scale enterprises in rural areas. A similar conclusion was made by Kooijman-van Dijk and Clancy (2010) who stipulated that location near an exploitable resource such as a market opportunity is important for enterprise development.

2.2.3 Rural Electrification and Profitability of Enterprises

Based on existing empirical literature, it is revealed that rural electrification contributes to the overall productivity of enterprises by reducing cost of production. One recent study

conducted in Bangladesh by Barkat et al. (2002) found that the average cost of production was lower for electrified than non-electrified industries. Similarly, the study established that the productivity per hour was higher in electrified industries than in non-electrified industries.

There is also evidence from Bangladesh that rural electrification considerably led to significant changes in profits. The study which was aimed at evaluating the impact of electricity availability on operation and performance of small scale enterprises in the rural areas of the country detected favourable changes on the production costs and profit margin (Bose et. al., 2013). In addition, findings demonstrated that profit was equal to no electricity service interruption, low connection cost and low production. They further illustrated that price cuts and discounts to attract customers were possible when production cost was low. Similar findings were observed in Kenya by Kirubi (2006). He found that electricity increased productivity of small enterprises as more products were made per day. It was therefore more profitable to lower prices leading to more and faster sales. This brought in an aspect that increased productivity did not necessitate an increase in profits, rather a reduction in prices did.

Further evidence on profitability can be seen from a study which was undertaken in three countries namely Tanzania, Bolivia and Vietnam by Kooijman-van Dijk and Clancy (2010). Results from the study showed that there were more customers in need of services such as mobile phone charging and grain milling because electrification reduced their travel and waiting time for such services. Electrification in this case stimulated

growth of new enterprises and replaced traditional lighting with electric lighting for enterprises. The study however observed that profits in such enterprises were lower due to market saturation. Most enterprises were providing similar services and this reduced the total revenue made. In instances where total revenue is lower and costs are high, the profits are low as well.

Akpan et al. (2013) examined how rural electrification through extension of existing grid had impacted rural micro-enterprises in Niger Delta, Nigeria. The study used a log-linear regression model, findings revealed that on average, enterprises in communities connected to the electricity grid were 16.2% more profitable than enterprises in communities not connected to the grid, and the use of generating sets in providing back-up electricity made micro-enterprises more profitable. The study also found that the high cost of self-generated electricity increased the total cost of doing business in rural areas thus reducing the profit margin of the micro-enterprises.

Through a literature review on impact of rural electrification on enterprises, Attigah and Mayer-Tasch (2013) disputed the positive findings on profitability. Using the World Bank's Doing Business report as the reference point, they argued that firms in low-income countries are affected by electricity supply interruptions and this results in workflow interruptions and damage of sensitive electrical equipment. The report further indicated that in the various countries estimated losses due to electricity outages amount to an average of 3.2% of annual sales and as much as 22.6% in Malawi (World Bank 2010).

2.2.4 Rural Electrification and Daily Operating Hours

There is a thin line between daily operating hours and profitability of SSEs. In a study done in Kenya, Kirubi (2006) attributed increase in profits to longer trading hours made possible through rural electrification. In support of this assertion, Bose et al. (2013) argued that longer operating hours increase sales and the greater the volume sales, the higher the profits for enterprises. Several studies confirm the association between daily operating hours and profits (Khan, 2001; Nyabeze, 2001) as cited in Meadows et al. (2003). Findings from those studies revealed that rural electrification extended daily operating hours in the evening with an increase of 3 hours per day, citing an example of tailors who worked for four more hours and had their revenue increased by 30%. This literally means that instead of closing businesses earlier, lighting provides enterprise owners with an opportunity to operate during evening hours.

The underlying assumption drawn from the literature is that longer daily operating hours contribute to profits by attracting more customers during the afterhours and increasing sales. While the link between access to electric light, longer operating hours and increased profits is often taken for granted, an overall positive impact cannot always be proven. As noted by Attigah and Mayer-Tasch (2013), this can only work when demand is high and in a situation where customers are available. Drawing from the insights of the theory of the firm, having more sales is not a guarantee that maximum profitability can be achieved as this only works in a context where the marginal revenue is equal to the marginal cost (Lipsey and Chrystal, 2011).

2.2.5 Gender Dimension of Rural Electrification

Previous studies examining and comparing the performance of female and male owned enterprises have found that female enterprises underperform on a variety of measures such as revenue, profit, growth and closure rates (Robb and Watson, 2010). However, Chirwa (2004) observed that the relationship between gender and business performance is quite complex as there is mixed evidence on the same in the literature (Sabarwal and Terrell, 2008). Results from Chirwa's (2004) study showed no significant differences in profit margins between male and female owned enterprises but differences could be observed in growth in terms of employment and sales. The gender differences in performance arise due to a number of factors. Findings from a Finscope Survey in Malawi indicated that females are mostly concentrated in retail enterprise sector compared to males who mostly dominate service and production enterprises (FinMark Trust, 2012). Retail enterprises tend to have lower profit margins than non-retail enterprises and account for loss of profits in female owned enterprises (Anna, Chandler, Jansen and Mero, 2000). Another reason for underperformance can be educational qualifications of the enterprise owner. Chirwa (2004) found that education of the enterprise owner was a critical factor for the success of female than male owned enterprises. For instance, completion of junior secondary education and higher education were positively related to profitability among female owned enterprises. The methodology used can also account for gender differences (Westhead, 2003) when factors such as type of enterprise, daily operating hours and education amongst other demographic characteristics are uncontrolled for.

Similarly, some authors have argued that sex of the enterprise owner affects the daily operating hours. Zolin, Stuetzer and Watson (2013) argued that the most affected are female enterprise owners because of family commitments. Adding to this argument, FinMark Trust (2012) pointed out that pressure to run the household and manage the business often reduces the time during which female enterprise owners are available for business. In the end, they have less time to devote themselves to their businesses. This leads to differences in daily operating hours between male and female enterprise owners.

There is recognition that there might be gender differences in performance of male and female owned electrified enterprises. This concept is built on the argument raised by Meadows et al. (2003) that that rural electrification might have a gender dimension. However, there is little evidence in support of this assertion as only a few studies on rural electrification (Kirubi, 2006) have gender disaggregated results. Where females were mentioned in studies on rural electrification, the focus was on the reproductive part (Kirubi, 2006 and Chilipaine-Banda, 2006) reinforcing the image that women are just confined to the domestic sphere (Cook, 2011; Fishbein, 2003 and NSO, 2012) and cannot be as successful as men. This makes it difficult to determine the influence rural electrification has on type of enterprise, profitability and daily operating hours of female owned enterprises and establish reasons for underperformance of female owned enterprises in relation to males.

Building on the existing literature, the concept grabbed is that all the factors mentioned in the section might contribute to equal or over or underperformance of male and female

owned enterprises but it is unknown if differences would exist in enterprises using electricity. In this context, the study therefore sought to determine the extent of their influence on type of enterprise, profits and daily operating hours in electrified enterprises.

2.3 Conceptual Framework

Owing to the ongoing debate on the linkage between rural electrification and small scale enterprises, several frameworks have been developed by various studies to understand the dynamics of the linkage. This study adopted and modified 'The Energy Quality of Life Framework' by Obeng and Evers (2009) which illustrated the multi-sectoral linkages of solar photovoltaic (PV) rural electrification's influence on quality of life in rural communities. Their conceptual framework provided a clearer understanding of the link to goals in education, health, information and communication, agriculture and micro-enterprise. However, the influence on micro-enterprises is what was borrowed from their framework. In addition to the lessons drawn from the framework above, this study also borrowed some insights from the theoretical literature and other studies to portray changes accrued to rural electrification on enterprises. This is the case because there is strong support on the perceived benefits of the same on enterprises in the literature.

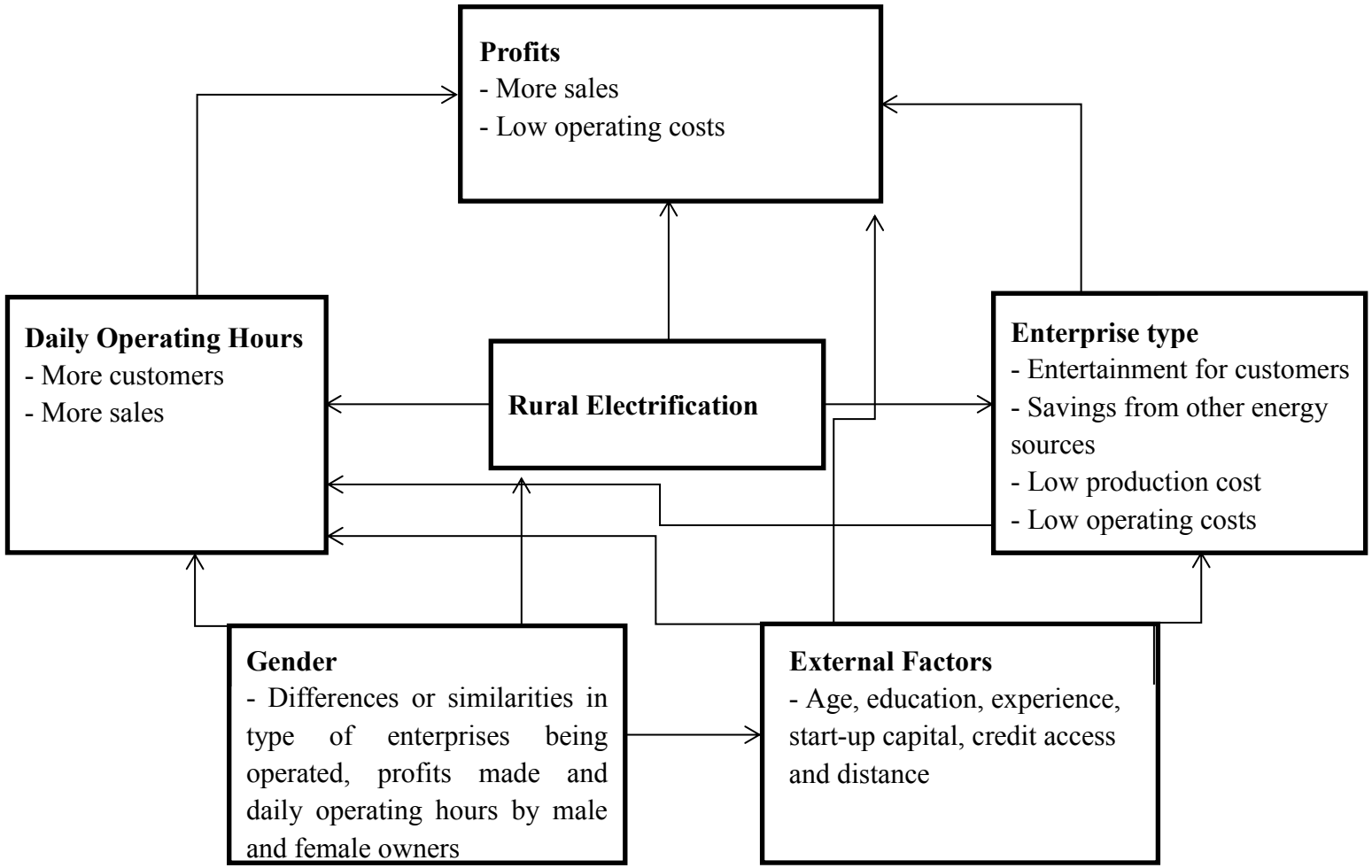

Figure 1: A Framework for Understanding the Link between Rural Electrification and Performance of SSEs

Source: Generated by the present author based on insights from literature and a study by Obeng and Evers (2009)

As shown in Figure 1, a framework was designed for the study with the intention of outlining the linkages between the intervention (rural electrification) and dependent variables (daily operating hours, profits, type of enterprise, and gender dimension) in small scale enterprises. In this regard, the framework shown suggests that there are direct linkages between the intervention and the variables of the study. However, one variable (gender) which in this study is referred to as independent (because it not part of the main variables of the study) has direct linkages to other remaining variables apart from having a linkage with the intervention. The purpose of understanding these linkages was to assist in developing a model which would assess the influence of the intervention on the variables of the study.

Several studies have found empirical support for the view that rural electrification drives the type of enterprise being operated (Maleko, 2005), profitability (Akpan et al., 2013) and daily operating hours (Kooijman-van Dijk and Clancy, 2010). In line with this view, rural electrification takes centre stage in Figure 1. The presence of electricity is perceived to have an influence on daily operating hours in two ways. Firstly, enterprises could have more daily operating hours due to the availability of electricity after the normal trading hours (Kooijman-van Dijk and Clancy, 2010). In their framework, Obeng and Evers (2009) showed that energy provides external lighting and security for enterprise owners. It follows then, that availability of light at dark places through street lights increases opportunities for night trading and contributes to women's safety. Secondly, more daily operating hours could attract customers and increase sales (Kirubi, 2006 and Bose et al., 2013). Sales made could therefore contribute to the overall profitability of business

enterprises in a context where the operating costs including production costs are low. Borrowing insights from the theory of the firm, profitability could be realized when the marginal revenue equals the marginal cost (Lipsey and Chrystal, 2011).

Rural electrification is also perceived to influence the type of enterprise to be operated (Mapako and Prasad, 2008). The assumption is that there might be some enterprises which are associated with the inception of rural electrification. According to Willcox et al. (2015), existence of some enterprises depends solely on electricity. A good example of such enterprises includes welding shops. In addition to the discussed opportunities, electrification allows diversification of business activities. Electricity is further assumed to contribute to the overall profitability (Bose et. al, 2013) of these enterprises. Obeng and Evers' (2009) framework highlighted that profitability is realized in a context where enterprise owners provide entertainment for customers and save from using alternative sources of energy. Electricity therefore provides opportunities for enterprise owners to reduce production and operating costs.

In addition, rural electrification, just like any other intervention might not provide the same opportunities to male and female enterprise owners (Meadows et. al, 2003) in terms of the daily operating hours, profits made and type of enterprise being operated. Therefore gender cuts across issues to do with daily operating hours, profits and type of enterprise hence its inclusion in the framework. However, there might be other factors besides electricity (rural electrification) that can account for the type of enterprise being operated, the profits made and the daily operating hours. These factors include age,

education and experience of the enterprise owner, start-up capital, credit access and the distance travelled by the enterprise owner from home to the market place. Differences or similarities may exist between enterprise owners of the same or opposite sex in terms of age, education, experience, start-up capital, credit access and the distance they travel from home to the market place. Justification for including these factors was drawn from the theories of change which stipulate that external factors should be considered as singling out the impact of an intervention in their absence becomes a challenge. These factors have been covered in detail in Chapter Three.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

This chapter presents the methodology used in the study. The first section provides the research design. Section 3.2 and 3.3 describe the study area and sampling methods used. Section 3.4 describes how data was collected in the study. Section 3.5 presents data analysis methods and the model specification. Section 3.6 provides limitations for the study and the final section outlines the ethical considerations.

3.1 Research Design

This was a cross sectional survey which adopted a mixed methods approach. The cross sectional survey design was appropriate in this study because data was collected at one point in time. The mixed methods approach which uses both quantitative and qualitative methods during data collection and analysis was adopted in the study to ensure that data was effectively interpreted using the narrative as well as numbers and figures (David and Sutton, 2011). In addition, the approach helped the researcher to understand the rural electrification concept better and provide meaningful inferences and analysis.

3.2 Study Area

The study was conducted in the area under Traditional Authority (T/A) Mwambo in Zomba District. Zomba is one of the districts known for its diversity of enterprises and having the highest proportion of enterprises whose owners or managers are members of a registered business association (NSO, 2012). Zomba District was also selected to reduce the amount of time and money involved in carrying out the research as it was close to the researcher's base. The area under T/A Mwambo had, according to the 2008 Population and Housing Census, a total population of 116,083 (Zomba District Council, 2009). T/A Mwambo was selected for this study because it has low secondary school enrolment rates, high population growth and scarcity of land which force people to engage in business (Zomba District Council, 2009).

As trading centres are market places for rural entrepreneurs, data used in the study was collected from Jali and Gomani Trading Centres. Jali was purposively selected as the treatment group because it has electricity and has an environment which is vibrant to support business activities such as the presence of a large number of enterprises. Gomani was also purposively chosen as the control group for the study because it is un-electrified and is closer to Jali Trading Centre. Having a treatment and control group provided a large enough sample to get reliable statistical estimates for quantitative analysis purposes (David and Sutton, 2011) and to observe variations between enterprises connected and those not connected to electricity as per the comparative analysis component stipulated in the theories of change.

3.3 Sampling

The study population included enterprise owners and key informants comprising chairpersons overseeing marketing activities as well as village heads from the treatment (Jali) and control group (Gomani). The sample population comprising treatment and control groups was randomly assigned into two equal size groups to achieve comparability between the treatment and control groups (Babbie, 2007) and to make analysis meaningful (Angelucci and Di Maro, 2010). In each study area, equal numbers of males and females were selected. For enterprise owners, three samples were drawn, one for electrified users (those using electricity in their businesses) and non-electrified users (those not using electricity in their businesses) in the treatment group and another one for non-electrified users in the control group.

Literature recommends a minimum sample size of 30 (David and Sutton, 2011), and therefore, for enterprise owners, n=90, thus 30 for electrified users and 30 for non-electrified users in the treatment group and 30 for non-electrified users in the comparison group. For key informants, n=4, 2 from treatment and 2 from the comparison groups. In total, there were 4 key informants comprising 2 village heads and 2 chairpersons. All the key informants were males. In each trading centre, 2 key informants comprising 1 village head and 1 chairperson were selected for the study.

The total number of enterprises identified in both Trading Centres was 240 comprising 150 enterprises from Jali and 90 enterprises from Gomani. Out of 150 enterprises in Jali, 40 were electrified and 110 were non-electrified. Out of these 240 enterprises, 140

enterprises were run by males and 100 by females. A sampling list of enterprise owners was constructed through an enterprise listing exercise that took place in all the targeted Trading Centres. This was done because there were no records of existing enterprises operating in the Centres. From this sampling frame, the stratified random sampling procedure was used to select a representative study sample. For each sample, lists were compiled based on the sex of the enterprise owner and the presence or absence of electricity in the enterprise. From the lists, every second respondent was selected randomly until the maximum number of 30 comprising 15 males and 15 females was reached in each sample group.

3.4 Data Collection

Semi structured interviews were conducted to obtain both qualitative and quantitative data from entrepreneurs. Similarly, key informant interviews with open ended questions were also administered to key informants to seek new insights, to ask questions and to explore more about rural electrification (Saunders, Lewis and Thornhill, 2003). Key informant interviews were mainly used to collect qualitative data from key informants. In total, 90 semi structured interviews were administered, 60 in the treatment and 30 in the control group. Nevertheless, 4 key informant interviews were also administered, 2 in the treatment and 2 in the control group. The data collection exercise was done over a period of 5 days.

3.5 Data Analysis

Both qualitative and quantitative data analysis methods were used but quantitative ones took precedence in order to estimate the magnitude of electrification's impact on type of enterprise, profits and daily operating hours of SSEs. Quantitative data was analyzed using STATA Version 12. Since the study had three samples, one for electrified and non-electrified users in the treatment group and another one for non-electrified users in the other group, descriptive statistics were estimated for each sample. Furthermore, inferential statistics and other statistical summaries were estimated for analysis and interpretation of findings.

On the other hand, qualitative data was analyzed using content analysis. This was done by identifying major themes concerning the history of rural electrification in Jali area and its perceived importance in SSEs. This later helped the researcher make interpretations and conclusions for the study.

3.5.1 Model Specification

This study adopted Chirwa's (2004) models with some modifications to suit the objectives of our study. Chirwa (2004) used econometric techniques such as multinomial logistic regression and linear regressions based on Maximum Likelihood Estimation and Ordinary Least Squares (OLS) methods respectively to analyze the effect of gender on performance of small and medium enterprises. Type of enterprise, profit and daily operating hours were identified as performance indicators and these were derived from the objectives of the study. Three models in particular, were fitted on the data: one of

which sought to (establish) the relationship between (entrepreneur's) characteristics (including that of the surrounding environment) and the dependent variable, type of enterprise; another sought to determine (factors) that were influential to an increase in business' profits. Lastly, as operating business hours can have a significant effect on the success of business, another OLS multiple linear regression model for daily operating hours was fitted on the data. The stated models can be summarized in the following equation:

$$\mathrm{DV} = \beta_0 + \beta_1 \mathrm{ECH} + \beta_2 \mathrm{BCH} + \beta_3 \mathrm{CVA} + \beta_4 \mathrm{ELEC} + \varepsilon$$

Where:

- DV represents a dependent variable, each with a model of its own. In this case, DV can be *Type of enterprise, Profit* and *Daily Operating Hours*
- β_0 is the constant term/the average effect when all other variables are zero and β_i's represent coefficients/rates of change in the DV for a unit change in the corresponding independent variable
- ECH is a vector of entrepreneur characteristics e.g. age, sex, education and business experience;
- BCH is a vector of business characteristics e.g. capital, daily operating hours and type of enterprise;
- CVA is a vector of control variables e.g. credit access and distance;
- ELEC indicates the presence or absence of electricity;
- ε is an error or stochastic disturbance term which takes into account all other explanatory variables that are not mentioned in the regression models.

In determining factors that were associated with type of enterprise, a categorical dependent variable, a multinomial logistic regression was fitted. On the other hand, Ordinary Least Squares (OLS) multiple linear regression model was fitted for profit and daily operating hours; which were both continuous dependent variables to determine the existence of a linear relationship between the mentioned dependent variables and other independent variables. In addition, explanatory variables were both categorical and continuous in all the models.

To understand better the relationship between dependent variable and the explanatory variables, in particular sex/gender and access to electricity, an interaction term was included in the three models. Interaction effects represent the combined effects of factors on the dependent measure. In particular, when an interaction effect is present, the impact of one factor depends on the level of the other factor. Therefore, an interaction model was run for each DV with the purpose of estimating the gender differences if any, in the role of rural electrification. In this study, for example, access to electricity was assessed to determine if its effect on, profit for example, was the same in males and females. The null hypothesis tested was that no gender differences existed in the role of rural electrification on type of enterprise, profits and daily operating hours.

After running regression models, Wald Tests were further performed to determine the hypothetical differences of the parameters in a particular already fit model. Under the Wald statistical test, the maximum likelihood estimate of the parameter(s) of interest was compared with the proposed value (while holding all other variables constant), with the

assumption that the difference between the two would be approximately normally distributed. These hypothetical differences were used to determine the positive externality and total impact of rural electrification on profit and daily operating hours between electrified and non-electrified enterprises across the three samples. The null hypotheses tested were that no differences existed in profits and daily operating hours between the following sample groups; Jali electrified and Jali non-electrified users, Jali electrified and Gomani non-electrified users and Jali non-electrified and Gomani non-electrified users.

3.5.2 Variable Description, Justification and Expected Results

In this study, the dependent variables were type of enterprise, profit and daily operating hours. The explanatory variables were categorized into four vectors or groups namely; entrepreneur characteristics, business characteristics, control variables and presence or absence of electricity. Each variable in the vector had an independent effect on the dependent variable.

3.5.2.1 Entrepreneur Characteristics

The variables included in this category were sex and age of the enterprise owner, education, capital and business experience. Sex of the entrepreneur was captured by dummy variables, male, which took the value 1 if the owner was male and 0 if otherwise. Education was taken as a dichotomous variable with those with primary education or below labelled as 0 and those with secondary education or above labelled as 1.

Some authors have argued that electrification has a gender dimension (Meadows et al., 2003). This is based on the argument that development affects men and women differently, and women and men will experience different impact from projects (CEDPA, 2010). Therefore, sex was included in the study to estimate the gender differences if any in the role of rural electrification on the DV's mentioned earlier. The assumption was that one's sex was likely to influence the type of enterprise run, profits made and daily operating hours (FinMark Trust, 2012 and Chirwa, 2004).

Age was included based on the assumption that it affects business performance. Kristiansen, Furuholt and Wahid (2003) found a significant correlation between age of the entrepreneur and business success as older entrepreneurs were more successful than younger ones. The expectation therefore was that older enterprise owners were more likely to earn higher profits and have more daily operating hours than younger ones.

Education level of entrepreneur was also included as relevant education is positively correlated to business success (Bowen et al., 2009). For instance, Chirwa (2004) found that profitability was higher for entrepreneurs with higher education than those with lower or no educational qualifications. The expectation therefore was that enterprise owners with higher educational attainment were more likely to make more profits and have more daily operating hours than those with lower or no education qualifications.

According to literature, any business enterprise is shaped by experience of the entrepreneur. Akpan et al. (2013) argued that experience or number of years in business

sometimes affects profitability because overtime, enterprise owners will have a learning curve on how to minimize cost and optimize productivity. Meadows et al. (2003) further added that the impact of electricity is felt by survivalist micro-enterprises and those that are already relatively well established businesses, and is not so much a contributing factor in the emergence of new micro-enterprises. The expectation was that experience would have no impact on the type of enterprises but on profit and daily operating hours for electrified enterprises.

3.5.2.2 Enterprise Characteristics

The variable under this category was capital. As observed by Sabarwal and Terrell (2008), sometimes lower profits between entrepreneurs can be attributed to the amount of capital used to start a business. This start-up capital can vary from entrepreneur to entrepreneur depending on the nature of business. Watson (2002) for instance, found that businesses in retail category require less capital compared to other categories. The expectation for capital was that it would influence the type of enterprises to be operated and profits made per month.

Some authors have argued that electrification might have a gender dimension (Meadows et al., 2003). This is based on the argument that development affects males and females differently, and males and females would experience a different impact from projects (CEDPA, 2010). Therefore sex was included in the study to estimate the gender differences if any in the role of rural electrification on the DV's mentioned earlier. The assumption was that the type of enterprise being run, the profits made and the daily

operating hours were likely to be influenced by one's sex (FinMark Trust, 2012 and Chirwa, 2004).

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Education level of entrepreneurs was also included as relevant education is positively correlated to business success (Bowen et al., 2009). For instance, Chirwa (2004) found that profitability was higher for entrepreneurs with higher education than those with lower or no educational qualifications. The expectation therefore was that profits and daily operating hours were more likely to be different between enterprise owners with higher and lower educational qualifications with the former making more profits and having more daily operating hours than the later.

According to literature, any business enterprise is shaped by experience of the entrepreneur. Akpan et al. (2013) argued that experience or number of years in business sometimes affects profitability because overtime, enterprise owners will have a learning curve on how to minimize cost and optimize productivity. Meadows et al. (2003) further added that the impact of electricity is felt by survivalist micro-enterprises and those that are already relatively well established businesses, and is not so much a contributing factor

in the emergence of new micro-enterprises. The expectation was that experience would have no impact on the type of enterprises being operated but on profit and daily operating hours of electrified enterprises.

3.5.2.3 Control Variables

This category had two variables, distance and credit access. The control variables were useful in this study because electricity usage in business depends on various external and internal factors such as access to markets, location and other assets of the entrepreneur (Attigah and Mayer-Tasch, 2013). Costa, Hailu, Silva and Tsukada (2009) observed that electricity provision enables several economic activities to be developed thereby expanding the opportunities for market work. Seeing the opportunities brought by electricity, most enterprise owners settle near the market places. As argued by Kooijman-van Dijk and Clancy (2010), distance was more likely to affect the daily operating hours. For instance, the distance travelled by the enterprise owner from home to the market place was more likely to reduce or increase daily operating hours. In this study, distance was measured in terms of the time taken by enterprise owners to travel from home to the market place. One of the contributing reasons was that 97% of enterprise owners mentioned the distance they travelled to and from home in hours and minutes instead of miles.

Credit access was a dummy variable which took the value 1 if owner had access to credit and 0 if otherwise. The underlying assumption was that besides electrification other complementary local conditions such as affiliation to local business associations and

ready availability of adequate credit finance (Barnes cited in Meadows et al., 2003) might also influence enterprise development. Affiliation to local business associations might provide entrepreneurs with access to credit. In addition to this, access to credit might also determine the type of business to be deployed. For instance, Willcox et al. (2015) observed that access to credit remains a significant barrier to investment in electricity access and the equipment needed to use electricity productively for many rural enterprises. The expectation was that credit access was more likely to influence the type of enterprises being operated including taking up more challenging electricity induced businesses such as maize mills and profits made.

3.5.2.4 Rural Electrification

Three dummies were developed for electricity (ELEC) denoted by Jali users, Jali nonusers and Gomani nonusers. Jali users represented a group of enterprise owners from Jali Trading Centre that were using electricity in their businesses. Jali nonusers represented another group of enterprise owners from Jali Trading Centre that had no electricity connection in their businesses. Gomani nonusers represented a group of enterprise owners from Gomani Trading Centre which completely had no electricity connection in their trading centre and business enterprises. For Jali users, presence of electricity took the value 1 and 0 if otherwise, Jali nonusers took the value 1 for absence of electricity for non-users (non-electrified users) in Jali and 0 if otherwise and Gomani nonusers, absence of electricity for non-users took the value 1 and 0 if otherwise. The expectation was that the presence of electricity would influence the type of enterprise being operated, profits made per month and the daily operating hours.

For the models with an interaction term, sex and electricity, a dichotomous electricity variable was fitted to denote the presence or absence of electricity. Specifically, the presence of electricity took the value 1 and absence of electricity took the value 0.

3.5.2.5 Error Term

The error term accounts for the imperfect fitting of the model(s). It includes all unobserved and unexplained variables not captured in the regression model. To keep the regression model as simple as possible, ε was fitted in the model as a surrogate for all those factors that may have an effect on the DVs but were not taken into account explicitly. Justification for the inclusion of the error term was derived from the principle of parsimony which states that among competing hypotheses that predict equally well, the one with the fewest assumptions should be selected (Gujarati, 2004).

3.6 Limitations of the study

It was difficult to establish the exact capital and revenue estimates as most sampled enterprise owners had no records of their daily business transactions. For instance, 74% of the sampled enterprise owners relied on their memory to give estimates of their transactions, hence this might have affected capital and profit estimates. It was therefore difficult to establish if the capital and revenue estimates had been exaggerated or underestimated since there was no written evidence to validate them (see Table 3).

3.7 Ethical Considerations

Community entry and oral consent were sought from Group Village Heads and enterprise owners in the selected sites respectively. Participants were given the mandate not to reveal their names as some questions required them to disclose details of their financial transactions.

CHAPTER FOUR

RESULTS AND DISCUSSION OF FINDINGS

4.0 Introduction

This chapter presents the study findings and interpretation of the results. The chapter is divided into two sections; the first part gives an overview of entrepreneur and business characteristics. The second part is about inferential statistics where objectives are analyzed using results from statistical methods or models.

4.1 General Characteristics of Respondents

This section provides descriptive statistics of respondents and includes entrepreneur and business characteristics.

4.1.1 Entrepreneur Characteristics

Table 1: Distribution of Respondents by Age, Educational Attainment and Marital Status

	Gomani nonusers		Jali nonusers		Jali users		All	
	n	***percent***	***n***	***percent***	***n***	***percent***	***n***	***percent***
Age								
18-30	9	30	19	63	16	53	44	49
31-40	13	43	6	20	6	20	25	28
41-50	4	13	2	7	6	20	12	13
51-80	4	13	3	10	2	7	9	10
Total	30	100	30	100	30	100	90	100
Educational Level								
Primary or below	21	70	15	50	11	37	47	52
Secondary or above	9	30	15	50	19	63	43	48
Total	30	100	30	100	30	100	90	100
Marital Status								
Single	2	7	3	10	8	27	13	14
Married	21	70	23	77	18	60	62	69
Divorced	5	17	3	10	2	7	10	11
Widowed	2	7	1	3	2	7	5	6
Total	30	100	30	100	30	100	90	100

Notes: n for Gomani nonusers=30, Jali nonusers=30, Jali users=30 and All=90; Totals may not add up to 100% because of rounding.

As shown in Table 1, the highest proportion of the sampled enterprise owners were those in ages between 18 and 30. They represented 49% of the sample. As discussed earlier in section 3.2, business activity in TA Mwambo was an occupation for the majority of the youth who had failed to secure formal employment due to low levels of education. The group comprised 63% of Jali electrified users, 53% of Jali non-electrified users and 30% of Gomani non-electrified users. Key informants cited infrastructure development and

industry opportunities as some of the opportunities brought by electrification which attracted traders to Jali Trading Centre. This suggested that the presence of electrification was a motivation for younger people to venture into business in Jali. A similar trend was also observed in Nigeria by Akpan et al. (2013) who found that electrification reduced the barrier to the establishment of microenterprises by younger people in the electrified communities of the study area.

Bowen et al. (2009) found that educated individuals were more likely to make strategic decisions in business. Taking this point into account, respondents were asked to indicate their level of educational attainment. As shown in Table 1, at least half of the respondents in Jali electrified enterprises and non-electrified enterprises reported to have attained secondary education or above as compared to respondents in Gomani non-electrified enterprises. The sampled population with secondary education or above comprised 63% of Jali electrified users, 50% of Jali non-electrified users and 30% of Gomani non-electrified users. This trend suggested that electricity use in business was associated with higher levels of education.

In terms of marital status, it was observed that 69% of the sampled respondents were married, 14% were single, 11% were divorced and 6% were widowed. Out of the 62 respondents who were married, a majority of them were from electrified enterprises (37%) as compared to 34% from Jali non-electrified and 29% from Gomani non-electrified enterprises. As can be seen in the statistics displayed above, a majority of

respondents were married suggesting that business was considered as a means of generating an income to support their families after failing to secure formal employment.

4.1.2 Business Characteristics

Table 2: Distribution of Respondents by Enterprise Category, Business Skills, Business Workers and Credit Access

	Gomani nonusers		**Jali nonusers**		**Jali users**		**All**	
	n	***percent***	***n***	***percent***	***n***	***percent***	***n***	***percent***
Enterprise Type								
Retail	17	57	21	70	5	17	43	48
Service	12	40	7	23	22	73	41	46
Production	1	3	2	7	3	10	6	7
Total	30	100	30	100	30	100	90	100
Business Training								
Attended	2	7	6	20	4	13	12	13
Not attended	28	93	24	80	26	87	18	87
Total	30	100	30	100	30	100	30	100
Business Workers								
Paid employees	5	17	2	7	13	43	20	22
Family members	9	30	15	50	8	27	32	36
Just myself	16	53	13	43	9	30	38	42
Total	30	100	30	100	30	100	90	100
Credit Access								
Accessed	18	60	16	53	14	47	48	53
Not accessed	12	40	14	47	16	53	42	47
Total	30	100	30	100	30	100	90	100

Notes: n for Gomani nonusers=30, Jali nonusers=30, Jali users=30 and All=90

As shown in Table 2, a majority of sampled respondents were in retail than service and production category. The perception amongst respondents was that the use of electricity

in retail businesses was less important as most products being sold were agricultural based. A closer examination by sample group showed that respondents in electrified enterprises were more inclined to service (73%) than retail (17%) and production (10%) enterprises. Many of these service enterprises relied on electricity for their activities and would not have been economically possible without power. This may suggest large dependence of service enterprises on electricity than retail.

Being an essential component in business, sampled enterprise owners were asked if they had ever undergone any business training. As displayed in Table 2, however, only 13% of 90 respondents had undergone business training. Out of that figure, 2% were non-electrified users from Gomani and they indicated to have acquired management and planning skills; 4% were electrified users and they indicated to have acquired technical, management and planning as well as marketing skills; and finally, 7% were non-electrified users from Jali and they indicated to have acquired marketing as well as management and planning skills. The pattern showed that most enterprise owners lacked formal business skills. Rather than waiting for formal training institutions to train them, most respondents preferred acquiring business skills through informal means. For instance most enterprise owners cited family and friends as common sources of information where they learnt some business tips and acquired information regarding where they could buy items at wholesale prices. For some enterprise owners, this information was not useful as they relied on their personal knowledge. This confirmed Zomba District Council's Report (2009) that a majority of small scale businesses in

Zomba continue to be run on poor business management due to inadequate basic business knowledge and non-coordinated enterprise support.

Respondents were further asked to mention if they had any workers whether paid or family members based on the evidence that enterprises create employment for most rural people (FinMark Trust, 2012). Findings indicated a smaller percentage of enterprise owners with paid employees. Out of 90 respondents, only 40% had paid employees and the rest indicated a one man operation business while others indicated that family members helped them to operate their businesses. The figure for paid employees for electrified users was on the higher side compared to non-electrified users in the same area and Gomani. From start up to date, the figure for paid employees in electrified enterprises seemed to have increased from 11 to 22 indicating that most job opportunities were created by electrified enterprises than non-electrified ones.

As depicted in Table 2, electrified users (47%) were the least group accessing credit compared to non-electrified users in Jali (53%) and Gomani (60%). Most users were aware of existing institutional support structures such as business associations, lending institutions and informal lenders but tended to rely on friends and family for support. Gomani non-electrified users (83%) for instance showed a higher credit uptake in the past 12 months compared to Jali electrified (65%) and non-electrified users (50%). The source of credit for Gomani non-electrified users was friends and family. The trends showed that there were certain factors which were hindering enterprise owners from accessing credit

from existing structures and amongst the cited were; high interest rates, low business sales and nature of business.

Table 3 shows summary statistics of business attributes indicating measures of dispersion such as the mean for capital, daily operating hours, business experience, distance and profits made per month.

Table 3: Distribution of Respondents by Capital, Daily Operating Hours, Experience, Distance and Profit

	Gomani nonusers	**Jali nonusers**	**Jali users**	**All**
	mean	***mean***	***mean***	***mean***
Capital (MK)	7,021.00	17,028.00	105,617.00	43,222.00
Daily Operating Hours (hrs)	9.70	10.17	11.10	10.00
Experience (yrs)	9	10	10	10
Distance (hrs/min)	1.37	1.30	1.33	1.33
Profit/month (MK)	31,803.00	65,888.00	65,983.00	54,558.00

Notes: n for Gomani nonusers=30, Jali nonusers=30, Jali users=30 and All=90

Distance was measured in time (hours and minutes)

On average, respondents used MK43,222 capital to establish their business enterprises. The average startup capital was higher for Jali electrified users (MK105,217) than for Jali non-electrified users (MK17,028) and Gomani non-electrified users (MK7,021). The average capital used for service and retail enterprises by Jali electrified users was MK117,409 and MK104,100 respectively. Non-electrified users in Jali used an average capital of MK17,143 and MK16,612 and those in Gomani used aa average capital of MK12,668 and MK3,447 to establish service and retail enterprises respectively. The major variations in startup capital across the sample groups might suggest that more capital was required to startup enterprises requiring the use of electricity.

Results further showed that electrified users had more daily operating hours compared to non-electrified users in the same area and Gomani. On average, the daily operating hours were 11.10, 10.17 and 9.70 for Jali electrified users, Jali non-electrified users and Gomani non-electrified users respectively. The presence of electricity in Jali and the distance travelled from home to the market place by enterprise owners in both Jali and Gomani might explain the slight differences in the average operating hours.

Another question sought to establish the years in which the respondents established their businesses. Experience of enterprise owners was derived by subtracting year of establishment from year 2014. Whilst some enterprises started operating way back in late 1960's for Jali electrified users, the situation was different for their counterparts. Findings showed that 1967, 1983 and 1984 were the minimum years of business establishment for

Jali electrified users, Jali non-electrified users and Gomani non-electrified users respectively.

Monthly profits were also calculated for each sample group. Respondents were asked to indicate the revenue they made and the total costs per month and these were subtracted to estimate profits made per month. While there were slight differences in profits between Jali electrified users (MK65,983) and non-electrified users (MK65,888), results showed that profits for Gomani non-electrified users (MK31,803) were much lower. The slight differences in profits between electrified and non-electrified users in Jali might be attributed to the cost of operating the business. To illustrate this point, electrified users were on average getting a monthly revenue of MK157,433 and spending MK91,450 compared to non-electrified users in Jali who were getting a monthly revenue of MK130,081 and spending MK64,194. On the otherhand, non-electrified users in Gomani were getting a monthly revenue of MK80,040 and spending MK48,237. The pattern suggested that on average, the monthly profit was higher for sampled electrified users in Jali than for non-electrified users. The opinions or expectations of key informants that enterprises using electricity realized more profits compared to those not using electricity agreed with the above mentioned results.

4.2 Econometric Results

This section presents findings from multinomial logistic and linear regression models. Different explanatory variables were analyzed to determine if they had any effect on the choice of enterprise, profits or daily operating hours. Discussion was based on

explanatory variables which appeared significant in the models. For categorical variables, one group/category was selected as the base. For example, non-electrified Gomani was used as a base on which Jali (both electrified and non-electrified) enterprise owners were compared to; retail enterprise was used as a base on which service and production were compared to; females were compared to males, primary education or below was a base on which secondary education or above was compared to.

4.2.1 Type of Enterprises Associated with Rural Electrification

A multinomial logistic regression model was fitted on the data to identify the type of enterprises associated with rural electrification. Table 4 presents the estimated results after running the multinomial logistic model calculated at the estimated mean values of the explanatory variables. The study hypothesized that explanatory variables such as electricity, education, experience, capital, credit access and sex had no influence on the type of enterprise. In the model, retail enterprise was the base or reference category against which service and production enterprises were compared to. Retail enterprises include; shops, hardware, butchery, fish selling, selling farm produce, *thobwa* (sweet beer) and fritters. Service enterprises include; barbershops, saloons, rest houses, bars, video shows, electronics, tailoring, bicycle repairing, restaurants, tearooms and grain mills. Production enterprises include; welding, carpentry and bakery.

Table 4: Estimates on Determinants of Type of Enterprise

Model's Dependent Variable				
Enterprise				
Enterprise Category	**Service**		**Production**	
Variables	**coefficient**	**p value**	**coefficient**	**p value**
Retail (base outcome)				
Sex[1]	0.431	0.430	33.251	0.985
Secondary Education or above	-0.659	0.276	-32.166	0.976
Credit Access	-0.073	0.890	-0.342	0.825
Experience	0.014	0.642	0.013	0.872
Capital	0.000	0.732	0.000	0.566
Jali users	2.000	0.009***	4.237	0.035**
Jali nonusers	-0.647	0.279	0.615	0.667
Constant	-0.4510	0.503	-34.589	0.984
LR Chi-squared	47.78			
Prob> Chi-squared	0.00			
Log Likelihood	-56.36			
N	90			

Notes: Sex[1]=Male; *** and ** denote significance at 1% and 5% respectively

As shown in Table 4, the log of odds for Jali electrified users relative to Gomani non-electrified users was 2 units higher for being in service relative to retail enterprises. This suggested that Jali electrified enterprises were more likely to be in service than in retail

enterprise category. Similarly, the log of odds for Jali electrified users relative to Gomani non-electrified users was 4 units higher for being in production relative to retail enterprises. These findings showed that service and production enterprises were associated with electricity connection than retail enterprises. To illustrate this point, out of 41 sampled service enterprises, 54% had electricity and out of 43 sampled retail enterprises, 12% had electricity. Adding weight to the estimation results, a Chi square test done to determine if there was any association between type of enterprise and electricity provided strong evidence that service enterprises were associated with electrification with chi-square value of 17.488 and p value of less than 0.001. The estimation results were also consistent with findings from key informant interviews which revealed that most electrified owners went for non-retail than retail enterprises. Electricity was required in electrified enterprises to power machinery used for providing different services such as lighting, refrigeration of goods, electronics, entertainment for customers, barbershop, saloon and grain milling.

4.2.2 The Effect of Rural Electrification on Profit

An OLS model for profit with the following explanatory variables fitted in was used; electricity, age, sex, education, type of enterprise and credit access to determine their effect on profit. However, as shown in Table 5, all the above mentioned factors were not significant except distance to the market place and electricity.

Table 5: OLS Estimates on Determinants of Profit and Daily Operating Hours

Variables	Model's Dependent Variable			
	Profit		Daily Operating Hours	
	coefficient	p value	coefficient	p value
Constant	49571	0.147	10.822	0.000
Jali users	50785	0.029**	1.369	0.036**
Jali nonusers	27280	0.164	0.411	0.525
Sex[1]	32950	0.057*	-0.170	0.747
Age	-205	0.767		
Secondary education or above	-15166	0.423		
Service Enterprise	-56886	0.002***		
Production Enterprise	-46393	0.212		
Capital	0.101	0.192		
Credit Access	2703	0.865		
Experience			0.005	0.873
Market Distance			-0.790	0.035**
R-squared	0.194		0.103	
F-statistic	2.14		1.92	
Prob> F	0.035		0.099	
N	90		90	

Notes: Sex[1]=Male; ***, ** and * denote significance at 1%, 5% and 10% respectively

As shown in the OLS model for profit in Table 5, electricity had a positive effect on profits especially for Jali electrified enterprises. The variable had a p value of 0.029. On average, enterprise owners with electricity had higher profit by a margin of MK50,785 than that of enterprise owners without electricity in Gomani. In support of this assertion, electrified enterprise owners indicated that electricity brought several opportunities to their businesses which included; providing lighting, extending their daily operating hours, powering up their machinery to continue providing services to customers and being able to diversify the nature of services provided. Electrified enterprises therefore, had an advantage over non-electrified enterprises in Gomani because these opportunities contributed to the overall profitability of their enterprises.

Similar results were observed after conducting Wald Tests which showed a p value of 0.029 providing further evidence that profits were different in Jali electrified and Gomani non-electrified enterprises. The significance of hypothetical differences in profits between Jali electrified and Gomani non-electrified owners showed the total impact of rural electrification. This is because the total impact measures the overall cluster-level difference between treated and pure control clusters (Baird, Bohren, McIntosh and Ozler, 2014). These findings indicated that electrified enterprises were more profitable than non-electrified enterprises and confirmed findings by Bose et al. (2013) which revealed that electricity led to significant changes in profits. However, this relationship is contrary to findings by Akpan et al. (2013) which showed that electricity was not a significant contributor for profits.

Similarly, results demonstrated that the type of enterprise over retail enterprises as the reference category affected profits. In this case, compared to retail enterprises, service enterprises had lower profits. Service enterprises were on average, found to have lower profits than retail enterprises by a margin of MK56,886. There was a commonality of views among key informants that non-retail enterprises were associated with high operating costs compared to retail enterprises because they had employees who had to be paid every month and machinery which had to be serviced regularly. This reflected the notions discussed in the theory of the firm that profitability was unlikely to be realised in cases where the marginal costs exceeded the marginal revenue. From the data, only 20 out of 90 enterprises had paid employees. Of the 20, 75% were in service, 20% were in retail and 5% were in production category. Although service enterprises were responsible for creating employment opportunities, there was an extra cost attached to them. However, this was not an issue in retail enterprises because most of them were one man operation businesses or were being run with assistance from family members.

There were similar views among key informants and enterprise owners in both Jali and Gomani regarding what they considered as the most profitable business in Jali and Gomani Trading Centres. 61% of enterprise owners including all key informants indicated that retail enterprises were the most profitable because these mostly sold agro-based products, required less capital and were on high demand. This suggested that retail enterprises had an advantage over non-retail enterprises as they used less capital and had more customers. This probably explained why service enterprises had lower profits compared to retail enterprises. Statistics displayed in Table 2 tallied with the perception

that retail enterprises were the most profitable over non-retail enterprises as a majority of the sampled enterprise owners were in retail than service or production categories. Contrary to these findings, Anna et al. (2000) found that retail enterprises had lower profit margins compared to non-retail enterprises.

Lack of business skills was found to be one of the factors that contributed to lower profits in service enterprises. As explained by Maleko (2005), lack of business skills results in loss of profits especially in service enterprises which require high level of technical competency to operate machines. In this study, there was a stronger dependence on electric machinery by service enterprises compared to retail enterprises. Statistics displayed in Table 2 further showed that only 7% of the sample population had business skills indicating a discrepancy in technical, marketing and management skills necessary for profit maximization. In support of the above mentioned statistics, it was reported that some enterprise owners were acquiring business skills informally from friends and family during the course of their business. FinMark Trust (2012) found that the incidence of lacking formal business skills was higher and a common problem among rural entrepreneurs in Malawi. This suggested that enterprise owners were missing out as entrepreneurial skills are required to identify new opportunities, create new enterprises and locate markets for the new products and services being provided.

As would be discussed in the paragraphs that follow, Jali electrified users largely dominated the service enterprise sector. This was confirmed by the estimates of enterprise type shown in Table 2. In addition to this, out of all 41 sampled service

enterprises, 54% of these belonged to Jali electrified enterprise owners. A deep analysis into the data showed that 72% of the revenue made was being used to pay electricity bills. High tariffs cited by electrified enterprise owners as one of the challenges they faced in their businesses tallied reasonably well with the loss of profits observed in service enterprises. It was reported that ESCOM officials and the chairperson in Jali were aware of this issue but nothing was being done to address the challenge. This suggested that this was an on-going problem and was likely to continue affecting service enterprises if not addressed.

Another contributing factor to lower profits in service compared to retail enterprises was frequent power interruptions. Based on the data, power interruptions accounted for 16% of reduction in monthly profits in electrified service enterprises. For those in service enterprises especially those running barbershops and grain mills, this meant that they had to wait for power to be restored for services to resume. The waiting time probably accounted for loss of revenue in most service enterprises. One key informant was quoted saying, “I buy items such as liquid milk at lower prices whenever there are power interruptions in the trading centre.” This was the case because perishable items were being sold at lower prices in tearooms and restaurants due to their short lifespan. However, the amount of revenue lost per day by electrified enterprises due to power interruptions was not assessed because the frequency of power interruptions was not captured in the study.

There was a higher likelihood of market saturation reducing the purchasing power and price margins of service enterprises in Jali. 73% of sampled Jali electrified users were in service enterprises, 17% in retail and 10% in production suggesting that a majority of electrified users were operating service enterprises. This trend showed that electrified users in service enterprises were more likely to provide similar services such as haircutting (barbershop). Similar findings were observed by Kooijman-van Dijk and Clancy (2010) who found evidence of enterprises in service category such as welding closing due to factors such as market saturation, lack of business experience and electricity disruptions. Further evidence on market saturation being the cause of profit loss was reported by Bose et al. (2013).

There was evidence of sex being one of the determinants of profits in small scale enterprises in the OLS model for profit. The coefficient for sex with p value of 0.057 was statistically significant at 10%. The results showed that male enterprise owners had on average MK32,950 more profit than female owners suggesting that male owners were doing better in profit compared to female enterprise owners. Contrary to these results, Chirwa (2004) found that both male and female owned enterprises had similar profit margins.

A separate Wald Test was done to compare the samples in the treatment group. This was done to estimate the existence of positive externality of electricity on non-electrified enterprises in Jali. As defined by Baird et al. (2014), the positive externality is the effect that arises from the treatment of other individuals in the same cluster. With a p value of

0.295, the results showed that Jali electrified and Jali non-electrified enterprises were making similar profits. One of the contributing factors could be that the two samples were operating in an electrified trading centre. However, no positive externality of electricity existed because the Wald Test results showed that non-electrified enterprises in Jali and Gomani were also making similar profits. The p value was 0.164 giving no evidence that Jali non-electrified and Gomani non-electrified enterprises were different in profits. The Wald Test results therefore portrayed the image that the issue of operating in an electrified trading centre was of little significance when it came to the average profits made per month.

4.2.3 The Effect of Rural Electrification on Daily Operating Hours

An OLS model for daily operating hours with the following explanatory variables fitted in was used; presence or absence of electricity, sex, distance from home to the market place and business experience to estimate their effect on daily operating hours. However, as shown in the OLS model for daily operating hours in Table 5, all the above mentioned factors except electricity and distance were not significant.

The expectation was that electrified users would have more trading hours because of the presence of electricity than non-electrified users. As depicted in Table 5, there was evidence that electrified enterprises had more daily operating hours than non-electrified ones and the coefficient for electricity was statistically significant with a p value of 0.036 at 5% level. Electrified enterprises had on average, 1 hour 37 minutes more per day of business operation than non-electrified enterprises indicating that electricity had an effect

on daily operating hours. Wald Tests further showed a p value of 0.037 providing evidence that daily operating hours for Jali electrified and Gomani non-electrified users were different. This confirmed the evidence from literature that electricity increases trading hours and covers issues to do with security for businesses by providing lighting during evening hours (Kooijman-van Dijk and Clancy, 2010; Kirubi, 2006; and Attigah and Mayer-Tasch, 2013).

It was further observed that distance and daily operating hours were inversely correlated with a correlation coefficient of -0.22 and a corresponding p value of 0.035. This suggested that enterprise owners staying far from the trading premises had reduced daily operating hours compared to those residing near the trading premises. Corresponding results were observed in the regression model in Table 5 which showed that distance travelled from home to the market place had a reducing effect on the number of hours an enterprise operated on daily. Longer distances covered by enterprise owners to get to the market place from their homes reduced the daily operating hours by a margin of 0.79 minutes. This was statistically significant with a p value of 0.035 at 5% level.

Jali electrified and Jali non-electrified enterprises were however observed to have similar daily operating hours through Wald Tests. With a p value of 0.140, the Test results showed no evidence that the two samples were different. This suggested that a positive externality of electricity existed to such an extent that the Jali samples were equally benefitting from the presence of electricity in Jali Trading Centre. Based on findings from key informants, the presence of street lights in Jali allowed enterprise owners to sell their

items up to 9pm. One key informant was quoted saying, "with electricity present, night becomes day and one is able to provide 24 hour service." On the other hand, the issue of positive externality was questionable as no significant differences in daily operating hours were observed when Jali non-electrified enterprises were compared with Gomani non-electrified enterprises. Wald Test results showed a p value of 0.525 giving no evidence that these samples had different daily operating hours. This suggested that operating in an electrified and non-electrified trading centre had no effect on daily operating hours. However, this could be explained by the fact that a majority of non-electrified enterprises were using other alternative sources of energy such as candles after hours to increase sales.

There were no differences in profits between non-electrified enterprises in Jali and Gomani because both were operating in similar market contexts hence having similar market opportunities. This was consistent with Kooijman-van Dijk's (2008) observation that having similar socio-economic characteristics could be one cause of indifferences between two sample groups. In support of this assertion, results from interviews with key informants showed that entrepreneurs in both trading centres had 2 market days (on different days) in a week with a similar set of buyers moving to and from Jali area as Gomani and Jali share borders. For instance, it was reported that it took about 25 minutes for one to travel from Jali to Gomani on a bicycle implying that Gomani was within walking distance. In addition to this, sales in both trading centres depended much on the season with sales increasing and decreasing in and out of season respectively. Sales were reported to be at peak during the season between March and July and off-peak during off-

season between August and February suggesting that they were operating in similar market contexts. Findings from Wald Tests therefore suggested that bringing electricity to Gomani Trading Centre could bring more pronounced results in terms of profits and daily operating hours because non-electrified Gomani enterprises were as good as non-electrified Jali enterprises.

4.2.4 Gender Differences in the Role of Rural Electrification

An interaction term was included in the three models to determine the gender differences in the role of rural electrification on type of enterprise being operated, profit and daily operating hours in SSEs.

Results showed that the effect of electricity on type of enterprise and profit did not depend on sex (See Appendix 2 and 3 for full results). However, the effect of electricity on daily operating hours depended on sex of the enterprise owner.

The effect of sex on daily operating hours increased in non-electrified enterprises by a factor of 0.543 and decreased in electrified enterprises by a factor of 1.55. Again, the effect of electricity on daily operating hours for females increased by a factor of 2.22 as compared to 0.13 for males. This suggested that there were significant differences in daily operating hours between male and female owned enterprises in electrified over non-electrified enterprises. The results were quite contrary to the expectations as most literature indicates that differences would exist, but in favour of men, because of family commitments which most of the times constrain women (Zolin et al., 2013). FinMark

Trust (2012) for instance, found that women compared to men had less time for business activities as they were mostly limited by the pressure to run a home, look after children and care for the husband and family.

Further analysis into the data and existing evidence was done to establish why this was the case. There was evidence in Table 5 that females operated close to their homes than males. It was observed that the shorter distance enterprise owners travelled from home to the market place, the higher the daily operating hours. On average, 73% of male and 87% of female enterprise owners walked less than 30 minutes to get to the trading premises. Differences in the distance travelled (in minutes) were observed probably because most females operated from home and this meant that they could easily combine reproductive roles with enterprise activities. Evidence drawn from literature supported distance as a contributing factor as findings showed that shorter distance allowed women to combine income generating tasks with household duties hence the women were more likely to operate closer to home (El-Hamidi, 2011; Kooijman-van Dijk and Clancy, 2010 and NSO, 2012).

Another contributing factor as reported by key informants in Jali was the presence of street lights in the trading centre. It was reported that a majority of female enterprise owners were seen trading after normal working hours. This was possible because street lights made it safer to walk the streets at night. Similar findings were reported by Obeng and Evers (2009) and Kooijman-van Dijk and Clancy (2010). Apart from the reason mentioned above, 80% of female enterprise owners cited that the businesses they were

running were their only source of income compared to 20% of male enterprise owners who cited other businesses and agriculture as their alternative sources of income. Being their only source of income, working more hours per day also explained why females had more daily operating hours compared to males.

CHAPTER FIVE

CONCLUSION AND POLICY IMPLICATIONS

5.0 Introduction

This chapter presents the conclusion and policy implications of the study. The chapter is outlined as follows: Section 5.1 gives the conclusion; Section 5.2 gives the policy implications; and finally Section 5.3 outlines areas of further study.

5.1 Conclusion of the Study

The study assessed the impact of rural electrification on small scale enterprises using key indicators such as type of enterprises, profits and daily operating hours. Besides electricity, several factors believed to contribute to the dependent variables were also examined using multinomial logistic and linear regression models. The general hypothesis was that these factors had no significant influence on the dependent variables. Furthermore, the gender differences in the role of rural electrification on type of enterprise, profits and daily operating hours were examined using an interaction term in the multinomial logistic and OLS models. The relationship between gender and electricity was found to be complex as there were no significant gender differences observed in the type of enterprises being operated and profits made, the differences only existed in daily operating hours between male and female enterprise owners in electrified

enterprises because most female enterprise owners operated close to their homes than male enterprise owners.

The conclusion drawn from the study results is that electricity plays a role in SSEs evidenced by its significant effect on type of enterprise, profits and daily operating hours. This implies that a direct impact exists. The results add to the theory of change as changes observed in type of enterprises, profits and daily operating hours can be attributed to electricity. However, there were no significant differences on the same among non-electrified enterprises suggesting that electrification alone is not a major factor in SSEs development. These results therefore demonstrate that it is not just an issue of operating in an electrified trading centre which influences the type of enterprises being operated, profits made and daily operating hours, other social factors such as willingness to pay, business training and levels of income also play a role.

5.2 Policy Implications

Collectively, these findings have a number of implications for policy development. The research has shown that profits made and the number of daily operating hours businesses were not that pronounced despite having electricity because of lack of business knowledge which means there is need to provide more business trainings in areas where there is rural electrification in order to maximize the potential of electricity in the SSEs. Business trainings could perhaps also address issues to do with keeping records of daily business transactions which was identified as the major limitation of the study as 74% of the enterprise owners had no records of their daily business transactions (see Section 3.6).

Coupled with business trainings, credit facilities need to be made available to electrified enterprise owners to fully realize their potential from the type of enterprises being operated, the profits made and trading hours. The results also support concerns that electricity supply should be reliable and tariffs should be reasonable to address the issue of high tariffs and power interruptions experienced by electrified users.

5.3 Areas of Further Study

There is need for further study to establish how frequent power interruptions affect daily operating hours in electrified enterprises.

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APPENDICES

Appendix 1: Marginal Effects Results of Determinants of Type of Enterprise

Variables	Enterprises	
	Marginal Effect	**P value**
Retail (base category)		
Sex[1]	-0.133	0.162
Secondary education or above	0.181	0.844
Experience	-0.003	0.635
Capital	-0.000	0.520
Credit Access	0.017	0.856
Jali users	-0.427	0.001***
Jali nonusers	0.107	0.356
LR Chi-squared	47.78	
Prob> Chi-squared	0.000	
Log Likelihood	-56.356	
N	90	

Notes: Sex[1]=Male; *** denotes significance at 1%

Appendix 2: Interaction Effects of Sex and Electricity on Type of Enterprise

Model's Dependent Variable				
Enterprise				
Enterprise Category	**Service**		**Production**	
Variables	**coefficient**	**p value**	**coefficient**	**p value**
Retail (base outcome)				
Sex[1]	0.828	0.182	19.890	0.998
Secondary Education or above	-0.843	0.169	-33.633	0.985
Credit Access	-0.152	0.776	-0.569	0.690
Experience	0.005	0.857	0.009	0.912
Capital	1.36E-06	0.692	0.000	0.534
Electricity	3.069	0.002***	-11.404	0.999
Sex*Electricity	-1.436	0.235	14.838	0.999
Constant	-0.751	0.246	-20.574	0.998
LR Chi-squared	47.59			
Prob> Chi-squared	0.00			
Log Likelihood	-56.45			
N	90			

Notes: Sex[1]=Male; *** denotes significance at 1%

Appendix 3: Interaction Effects of Sex and Electricity on Profit and Daily Operating Hours

Variables	Model's Dependent Variable			
	Profit		Daily Operating Hours	
	coefficient	p value	coefficient	p value
Constant	66313	0.042	10.79	0.000
Electricity	32998	0.231	2.22	0.006***
Sex*Electricity	6407	0.854	-2.10	0.064*
Sex[1]	29053	0.156	0.543	0.400
Age	-266	0.713		
Secondary education or above	-11124	0.558		
Service Enterprise	-58935	0.002***		
Production Enterprise	-42315	0.259		
Capital	0.106	0.175		
Credit Access	2237	0.889		
Experience			-0.01	0.836
Market Distance			-0.80	0.029**
R-squared	0.175		0.135	
F-statistic	1.88		2.62	
Prob> F	0.066		0.035	
N	90		90	

Notes: Sex[1]=Male; ***, ** and * denote significance at 1%, 5% and 10% respectively

Appendix 4: Correlation Matrix

	Age	**Experience**	**Capital**	**Distance**	**Profit**	**Daily Operating Hours**
Age	1					
Experience	0.350	1				
Capital	-0.013	-0.057	1			
Distance	0.013	0.083	-0.099	1		
Profit	-0.116	0.020	0.163	-0.190	1	
Daily Operating Hours	-0.014	0.005	0.151	-0.224	0.290	1

Note: No multicollinearity problem was detected between variables

Appendix 5: Questionnaire for Small Scale Enterprise Owners

My name is **Agness Tambuli** and I am a second year Master of Development Studies student at the University of Malawi, Chancellor College. I am conducting a research study to assess the impact of rural electrification on small scale enterprises in Zomba specifically targeting Jali and Gomani Trading Centres. You have been selected as one of the people who can give me information on the subject in question. Please assist me to obtain information for the study by answering the following questions. Your responses will solely be used for research purposes.

Are you willing to be interviewed?

Thank you for your time. For the purpose of this study I need to ask you some questions regarding electricity and your enterprise. The interview will take about 10-15 minutes to complete.

NAME OF TRADING CENTRE	
NAME OF RESPONDENT	
DATE OF INTERVIEW	[ ]/[ ]/2014

SECTION A: GENERAL INFORMATION OF SSE OWNERS

1.	Sex	1. Male 2. Female
2.	Age	[ ]

3.	Marital Status	1. Single 2. Married 3. Divorced 4. Widowed
4.	Ethnic Group	1. Chewa 2. Yao 3. Lomwe 4. Sena 5. Mang'anja 6. Other (specify).....
5.	What level of education did you complete?	1. No formal education 2. Some primary education 3. Completed primary education 4. Some secondary education 5. JCE 6. MSCE 7. Technical College 8. University
6.	Have you had any business training?	1. Yes 2. No
7.	If 'Yes', what skills did you acquire from the training?	1. Technical skills 2. Management/Planning skills 3. Marketing skills 4. Product design 5. None 6. Other (specify).....

SECTION B: ENTERPRISE CHARACTERISTICS

8.	Type of enterprise	1. Shop 2. Grain mill

		3. Barbershop 4. Saloon 5. Welding 6. Bar 7. Rest house 8. Electronics 9. Other (specify).....
9.	Year of establishment	[ ]
10.	Daily operating hours	[ ]
11.	Do you keep any accounting (written records) of your business costs and sales? **(If 'Yes', ask to see them)**	1. Yes 2. No
12.	Did you start business from scratch, purchased it or did you inherit it?	1. Started from scratch 2. Bought it 3. Inherited it 4. Other (specify) .....
13.	What was the principle source of money used to start the business?	1. Own savings 2. Retirement/Retrenchment money 3. Borrowed from friends/family 4. Loan from lending institution 5. Loan from business association 6. Informal lenders 7. Other (specify).....
14.	How much was the money?	[MWK]
15.	How many workers did you have when you were opening your business/enterprise?	1. [ ] Paid employees 2. [ ] Family members 3. Just myself
16.	How many workers do you have now?	1. [ ] Paid employees 2. [ ] Family members 3. Just myself
17.	Do you pay anything to Government such as market fee or tax?	1. Pay market fee 2. Pay tax 3. Pay both 4. Do not pay anything

18.	**(Do not ask if response was 4 in Q17)** How much do you pay?	[MWK]

SECTION C: ACCESS TO ELECTRICITY

19.	Do you have electricity in your community?	1. Yes 2. No **If 'No' skip to Q21**
20.	If 'Yes' when did electricity come to your community?	[ ]
21.	Do you think electricity is important in business?	1. Yes 2. No
22.	If 'Yes' in **Q21**, how important is electricity in business?	1. Provides clean energy 2. Provides lighting 3. Refrigerate perishable goods 4. Extends opening hours 5. Provides security 6. Powering up equipment and machinery 7. Other (Specify).....
23.	Do you use electricity in your business?	1. Yes 2. No **If 'Yes' proceed to Q24; If 'No' skip to Q31-34**
24.	In which year did you get connected to electricity?	[ ]
25.	What are the uses of electricity in your business?	1. Provides clean energy 2. Provides lighting 3. Refrigerate perishable goods 4. Extends opening hours 5. Provides security 6. Powering up equipment and machinery 7. Other (specify).....

26.	How were you doing these activities before you got connected to electricity?	1. Used alternative sources of energy 2. Manually 3. Stocked non perishable goods only 4. Closed business after sunset 5. Other (specify).....
27.	What alternative source(s) of energy were you using before you got connected to electricity?	1. Torch 2. Candle 3. Generator 4. None 5. Other (specify).....
28.	What was/were the source(s) you mentioned in **Q27** above used for in your business?	1. Lighting 2. Refrigerate perishable goods 3. Extend opening hours 4. Security 5. Powering up equipment and machinery 6. Other (specify).....
29.	Has electricity brought more opportunities to your business?	1. Yes 2. No **If 'Yes' proceed to Q30; If 'No' skip to Q35**
30.	If 'Yes', what opportunities have been brought?	1. Buy electrical assets 2. Provides lighting 3. Powering equipment 4. Diversifies business functions i.e. charging phones 5. Longer opening hours 6. Provides security 7. Other (specify)..... **From Q30, proceed to Q35**

31.	If 'No' in **Q23**, why don't you use electricity in your business?	1. Nature of business 2. High connection costs 3. High tariffs 4. Frequent power disruptions 5. No perceived benefits 6. No permanent structure 7. No electricity connection in the trading centre 8. Other (specify).....
32.	What alternative source(s) of energy do you use in your business?	1. Torch 2. Candle 3. Generator 4. None 5. Other (specify).....
33.	What is/are the source(s) you mentioned used for in your business?	1. Lighting 2. Refrigerate perishable goods 3. Extend opening hours 4. Security 5. Powering up equipment and machinery 6. Other (specify).....
34.	What business would you go for once connected to electricity?	1. Shop 2. Grain mill 3. Barbershop 4. Saloon 5. Welding 6. Bar 7. Resthouse 8. Electronics 9. None (maintain the old one) 10. Other (specify)..... **From Q34, proceed Q35**
35.	What businesses are considered	1. Shops

	most profitable in the trading centre?	2. Grain mills 3. Barbershops 4. Saloons 5. Welding 6. Bars 7. Resthouses 8. Electronics 9. Other (specify).....
36.	If you were asked about your business performance, would you say your business is doing well, fairly or poorly?	1. Well 2. Fairly 3. Poorly
37.	If that is the case, what is your average monthly revenue in Kwacha? (revenue = total sales without subtracting costs)	[MWK]
38.	On average, how much money do you spend per month to keep the business in operation?	[MWK]
39.	**(Ask if response was 'Yes' in Q23)** On average, how much money do you spend per month on electricity?	[MWK]
40.	**(Ask if response was 'No' in Q23)** On average, how much money do you spend per month on the alternative source(s) of energy you mentioned in Q30?	[MWK]
41.	What is the most important thing you do with your profits?	1. Used for household needs 2. Re-invest in business 3. Savings 4. Medical expenses 5. None 6. Other (specify).....

42.	**(Ask Q42, if business came into operation before 2010 and is using electricity, if otherwise, do not ask)** Would you say your business profits have increased, decreased or remained the same since inception of rural electrification?	1. Increased 2. Decreased 3. No change
43.	What other alternative sources of income do you have apart from this business?	1. Salary income from another job 2. Other business 3. Pension 4. Spouse salary 5. Other family members 6. Farming 7. None (this business only) 8. Other (specify).....
44.	**(Do not ask if response was 7 in Q43)** On average, how much income do you get in a month?	[MWK]
45.	**(Do not ask if response was 7 in Q43)** On average, how much of this income is used in this business per month?	[MWK]

SECTION D: ACCESS TO CREDIT

46.	What are the common sources of credit in this community?	1. Friends/Family 2. Business association 3. Lending institution 4. Informal lenders 5. Other (specify).....
47.	Do you obtain credit from any of these sources?	1. Yes 2. No **If 'No' proceed to Q54**
48.	Have you had access to credit in	1. Yes

	the past twelve months?	2. No **If 'No' proceed to Q54**
49.	From whom did you borrow money for your business in the last 12 months?	1. Friends/Family 2. Business association 3. Lending institution 4. Informal lenders 5. Other (specify).....
50.	How much did you borrow?	[MWK]
51.	What was the money you borrowed used for?	1. Built a permanent structure 2. Diversified services provided 3. Bought electrical equipment 4. Opened another outlet 5. Other (specify).....
52.	Are you experiencing any major challenge(s) regarding repayment?	1. Yes 2. No
53.	If 'Yes' please explain your answer	1. High interest 2. Low business sales 3. Nature of business 4. Competition 5. Other (specify).....
54.	What is the major barrier to access to credit?	1. High interest 2. Sex of the entrepreneur 3. No collateral 4. Problem of business 5. Credit schemes not available 6. Other (specify).....

SECTION E: ACCESS TO MARKETS

55.	Is there a market for the products/services you provide in this trading centre?	1. Yes 2. No

56.	Where do you commonly sell your commodities?	1. Home 2. Traditional market place 3. Roadside 4. Commercial district 5. Industrial site 6. Other (specify).....
57.	What is the distance (in hours/minutes) between your home and the market point?	[ ]
58.	How much does it cost you to take your commodities to the market?	[ ]
59.	Do you comply to any laws governing the use of the markets?	1. Yes 2. No
60.	What are these laws?	1. Paying market fee 2. Paying tax 3. Paying both market fee and tax 4. Registering the business 5. Other (specify).....

SECTION F: ACCESS TO INFORMATION

61.	What are the common sources of information regarding business in this community?	1. Friends/Family 2. Community meetings 3. Radios 4. Televisions (TVs) 5. Other (specify).....
62.	Where do you commonly source information regarding business for your enterprise?	1. Friends/Family 2. Community meetings 3. Radios 4. Televisions (TVs) 5. Other (specify).....
63.	What kind of information do you get from the source(s) you have mentioned?	1. Health related 2. Market related 3. Sales related 4. Other (specify).....

64.	How does this information help your business?	1. Health tips 2. Boost sales 3. Diversify nature of services provided 4. Other (specify.....

SECTION G: CHALLENGES FACED BY ENTERPRISE OWNERS

Ask Q65-67 if response was 'Yes' in Q23, if otherwise, end the interview

65.	Do you face any major challenge(s) in business when using electricity?	1. Yes 2. No **If 'No' end the interview**
66.	If '*Yes*' in Q65, mention the challenge(s)?	....
67.	How do you address the challenge(s)?	....

End of Questions

Appendix 6: Interview Guide for Key Informants

My name is **Agness Tambuli** and I am a second year Master of Development Studies student at the University of Malawi, Chancellor College. I am conducting a research study to assess the impact of rural electrification on small scale enterprises in Zomba specifically targeting Jali and Gomani Trading Centres. You have been selected as one of the people who can give me information on the subject in question. Please assist me to obtain information for the study by answering the following questions. Your responses will solely be used for research purposes.

Are you willing to be interviewed?

Thank you for your time. For the purpose of this study I need to ask you some questions regarding electricity and enterprises operating in this trading centre. The interview will take about 10 minutes to complete.

NAME OF TRADING CENTRE	
NAME OF RESPONDENT	
DATE OF INTERVIEW	[ ]/[ ]/2014

SECTION A: GENERAL INFORMATION OF KEY INFORMANTS

1.	Sex	1. Male 2. Female
2.	Age	[ ]

SECTION B: ELECTRICITY AND BUSINESS PERFORMANCE

3.	How many enterprises are in operation in this trading centre?	[ ]
4.	What type of enterprises are currently in operation in this trading centre?	1. Shop 2. Grain mill 3. Barbershop 4. Saloon 5. Welding 6. Bar 7. Resthouse 8. Other (specify).....
5.	**(Ask Q5-8 if key informant is from Jali Trading Centre if otherwise proceed to Q9)** Briefly explain how rural electrification came into this area (trading centre)	....
6.	What specific roles did you play to accelerate the coming in of rural electrification in this trading centre?	....
7.	How many enterprises existed before inception of rural electrification in this trading centre?	[ ]

8.	What type of enterprises in this trading centre are associated with electrification?	1. Shop 2. Grain mill 3. Barbershop 4. Saloon 5. Welding 6. Bar 7. Resthouse 8. Other (Specify)..... **Proceed to Q9**
9.	In your opinion, what opportunities does electrification bring to enterprises operating in trading centres?	....
10.	In your opinion, would you say electricity brings the same opportunities to female and male owned enterprises? Please explain your answer	....
11.	Do you think electricity adds value to enterprises? Please explain your answer	....
12.	Do you think enterprises with electricity outperform those without electricity? Give a reason for your answer	....

SECTION C: ACCESS TO CREDIT

13.	Are credit facilities available to entrepreneurs operating in this trading centre? Please explain	....
14.	Would you say access to credit prompts entrepreneurs to go for electricity driven businesses? Please explain your answer	....

SECTION D: CHALLENGES FACED BY SSE OWNERS

If key informant is from Jali Trading Centre continue with Q15-16; If otherwise, skip to Q17-19

15.	What major challenge(s) do enterprise owners in this trading centre face as a result of rural electrification?	....
16.	How can the mentioned challenge(s) be addressed?	....
17.	What major challenge(s) do enterprise owners in this trading centre face in the absence of electricity?	....
18.	Do you think electricity can help address the challenge(s)?	1. Yes 2. No

19.	If 'Yes', how can electricity address the mentioned challenge(s)?	....

END OF QUESTIONS