CORRELATES OF ICTS AND EMPLOYMENT IN SUB-SAHARAN AFRICA

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Abstract:
The potential for Information and Communications Technologies (ICTs) to influence development have been widely documented, however the impact of ICTs on the employment prospects of those in SSA have been poorly recorded, with most studies focused on specific localised contexts. This paper models the impact of ICTs on the employment outcomes of individuals in 12 African countries, taking into account the varying nature of self-employment compared to other types of third party employment. The paper finds a correlation between mobile phone ownership, the intensity of mobile phone use, and employment in a selection of countries and contexts. Internet use in 2012 is largely unrelated to the employment outcome in these countries. The impact of ICT use differs by geolocation, sex and age. Older people, most likely with more established prior networks, are more likely to have ICTs impact their employment outcome. ICTs are more likely to influence the employment outcome of males, and those in urban areas.

Keywords: ICTs, Mobile Phones, Intensity of Mobile Use, Internet, Employment, Self-Employment, Rural, Urban

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CONTENTS

1. INTRODUCTION

The uptake of Information and Communications Technologies (ICTs) on the African continent has lagged the rest of the world, but growth rates are in the double digits and the continent is fast catching up. Mobile penetration measured by sim ownership has reached over 100% in many African countries (GSMA, 2014). The same extent of take-up is not seen with internet, which for Africa still lags the rest of the world quite significantly. But, in the decade following the early 2000's, massive rises in mobile broadband infrastructure have taken off. These increases in mobile broadband investment and promoted access to the internet have started a mobile internet revolution on the continent, for which critical masses are still to be garnered. Up to this point, the port of call for understanding the impact of this ICT revolution on developmental outcomes the focus has been on access, barriers to access, and ways through which improved access can be provided.

However, as the continent increasingly catches up with the technologies seen in the global north, questions surrounding how ICTs are used in the development discourse are necessary. ICTs have already been linked to increased capabilities and freedoms for individuals (Rong, 2015). Related to such capabilities are whether these ICTs enable individuals to secure improved labour market outcomes. The aim of this paper is to evaluate just that.

This paper strives to move beyond simple access measures of ICT use, and to gauge whether the level of ICT use that an individual carries out over their mobile phone or the internet, whether basic, intermediate or advanced, exhibits any correlation with their labour market status. The literature provides evidence that this should be the case, in at least some countries, and is evaluated next.

2. LITERATURE REVIEW

Labour markets in developing countries play an important role in facilitating economic and social progress as employment status is a key determinant of whether a household, and individuals, reside in poverty. Obtaining a well-paid, secure job is the best way for individuals to escape the cycle of poverty. However, labour markets, particularly those in developing countries, are regarded as inefficient – characterized by large skills mismatches and imperfect information – acting as an impediment to economic growth and development. Often, suitably qualified individuals might be unable to obtain a job in another part of the country because they are unaware that such a job opening exists. Furthermore, even if an individual is aware of a job opening, it is often prohibitively expensive to travel long distances. However, the advent of wireless communications – especially mobile technologies in developing countries – has provided new possibilities for a more efficient labour market.

The focus on mobile cellular technologies, rather than other ICTs (e.g. computers or tablets), in Africa is well-justified. Taking the entire SSA region into account, the mobile penetration rate is 41%, which is forecast to increase to 49% by 2020 (GSMA, 2015). However, when only individuals over the age of 15 are considered, the mobile penetration rate jumps to 69% (Handjiski, 2015), and is naturally higher in countries like South Africa and Ghana with penetration rates of 62.1% and 59.8% as early as 2008 (Research ICT Africa, 2008). Mobile broadband connections in SSA are set to increase from 24% in 2015, to 57% in 2020, and smartphones from 160m to 540m (GSMA, 2015).

The mass uptake of mobile phones in Africa has had many distinct benefits with regards to labour markets. Firstly, mobile telephones greatly reduce the costs of finding a job, for instance through reducing search costs by up to 50% (Aker & Mbiti, 2010) and improving market efficiency, but also by obtaining prices for products, finding buyers and sellers, and information regarding significant events, often without needing to travel. Secondly, the flow of information on a mobile telephone is much faster than that of a radio or newspaper (Aker & Mbiti, 2010).

This allows job applicants to respond faster to job openings. Finally, the large geographic spread of mobile telephone networks allows users to easily contact individuals far away from their location of residence (Aker & Mbiti, 2010).

Aker and Mbiti (2010) state that because many individuals in African countries rely on pre-paid airtime, mobile phone operators have had to develop relationships with small businesses in the informal and formal sector. Secondly, additional shops have opened to sell and repair mobile telephones, generating additional employment. Stork, Moyo and Deen-Swarray (2013) show that mobile phones are commonly used among informal businesses.

The GSMA estimates that in Africa in 2010, the mobile phone ecosystem employed, directly or indirectly, nearly 5.8 million people corresponding to 1.4% of the total African workforce (GSMA, 2013). This corroborates a study by the World Bank (2015) which states that while direct job creation in the technology industry is significant, the larger impact has been through the users of digital tools, including basic ICT users.

Indeed, there is extensive evidence that gaining access to ICTs enables individuals previously excluded from important economic networks, access to these networks. This allows for the potential to enhance the wellbeing of individuals, households and informal businesses (De Silva et al., 2009; Rong, 2015).

Mobile telephones can also potentially improve coordination between firms and their suppliers (Aker & Mbiti, 2010). Qualitative research on small businesses conducted in South Africa and Egypt showed that the use of mobile telephones increased profits, turnover and the number of customers (Vodafone, 2005). Chair (2014) found that women in the South African informal sector used mobile phones in the everyday running of their businesses, resulting in increased communication with customers and suppliers, and increased community interaction.

Mobile telephones have also generated employment and entrepreneurship opportunities (Aker & Mbiti, 2010). While more skilled people are easily enabled to enter the formal labour market, many find micro-entrepreneurial opportunities through the networks of mobile phone card sales, repairs services and (increasingly dated) internet cafés. People need a place to purchase or repair mobile telephones, especially in remote or far removed areas. Furthermore, the informal sector has taken advantage of the growing mobile sector by selling prepaid mobile telephone cards – a crucial component influencing the take up of mobile telephones in Africa.

Finally, mobile telephones can reduce risk (Aker & Mbiti, 2010). As Africa remains a continent where the majority of workers are in agriculture, it usually bears a substantial economic cost whenever there is a natural disaster, health epidemic or a violent conflict. The faster flow of information through the use of mobile telephones can be used to warn farmers of potential shocks, allowing farmers to decide which crops to plant (Aker & Mbiti, 2010).

Jensen (2007) investigates the effects that mobile telephones have on the fisheries market in Kerala, India. Jensen finds that having access to a mobile telephone reduces the variability of fish prices, benefiting both producers and consumers: Fishermen's profit increased by approximately 8%, while prices decreased by 4%. Aker (2008) analyses the effects of the introduction of mobile telephones on the grain traders market in Niger and finds that grain price dispersion between different markets is reduced by a minimum of 6.4%. This reduction is primarily as a result of traders using their mobile telephones to reduce search costs and accumulate key market information. The author also finds that the greater the distance, and the poorer the quality of roads between markets, the greater the impact of mobile telephone coverage on prices, illustrating the gained efficiencies for these farmers.

On the supply side, Klonner and Nolen (2010) investigate the effect of mobile phone coverage on labour market outcomes in rural South Africa. Their results show that when a locality

receives mobile phone coverage, employment increases by 15%, with most of this attributable to an increase in employment among women. All the gains in employment are in wage-employed occupations, with no effect on the number of individuals who are self-employed. Lastly, there seems to be a sectoral shift in employment: agricultural employment decreases, especially amongst males, as mobile phone coverage is rolled out.

In summary, the studies show that mobile telephones have increased profits and employment and decreased costs. Internet use only increases the propensity for ICTs to reduce the costs of the job search. Job applicants can view online job websites or monitor social media for job opportunities. To do this, job applicants would have to purchase mobile data, although this is far cheaper than buying a newspaper (Aker & Mbiti, 2010). However, the potential for the internet to play a role as a job search mechanism is stifled by access and affordability: the type of technology used, the cost of data, and infrastructure roll-out. Chair (2014) found that women in South Africa's informal sector faced extremely high data costs, leading to exclusion from using this ICT as a medium of conducting business. Nevertheless, beyond access, local content generation in local languages, accessible to those in rural areas who are less likely to be proficient in English compared to those in urban centers, is important. Ultimately, as the mobile telephone becomes the primary means of accessing the internet in Africa, it is these beyond access issues that will determine its success as an enabler of human freedoms (Rong, 2015). These include issues such as literacy, which serves to reduce educational and socioeconomic gender gaps that exist between men and women.

Finally, there has been a paucity of research into the demographic profile of mobile users in Africa. Having said that, the limited data available reveals some interesting patterns. In a survey of twelve SSA countries, Khan, Chair and Deen-Swarray (2015) found that gender gaps between men and women exist when it comes to mobile ownership, but that these gaps are amplified between rural and urban geolocation. While males are more likely to own a cell phone than women, the inequality observed in ownership can be explained by education and income level. Women are economically more disempowered than men in these countries, and more so in rural areas (Khan, Chair & Deen-Swarray, 2015).

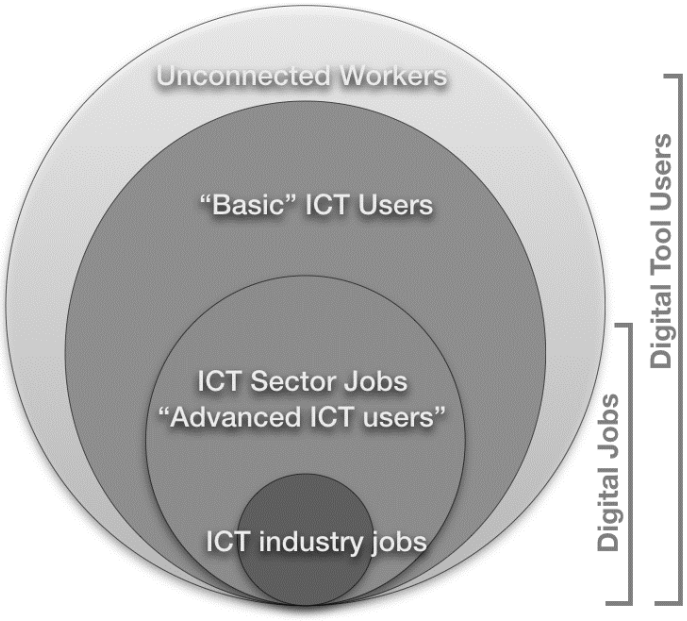
3. METHODOLOGY AND MODEL

3.1 Methodology – ICT use and employment

Two ICTs are considered in this paper: mobile ownership and use, and internet use. The relationship between employment and mobile ownership or internet use is not simple or one-directional. It is likely that employment more readily enables individuals to acquire a mobile phone or use the internet. However, as discussed in the literature review, decreases in the transaction costs associated with job search, and increased efficiencies gained for those who are self-employed (mainly in the agricultural sector) have been documented. Thus, the argument can be made that ICTs have assisted individuals in finding employment.

The technology industry has directly created millions of "digital jobs" (World Bank, 2015). These jobs are depicted by the first two concentric circles in Figure 1, and include those that make use of advanced tools and specific software as a main element of their work, irrespective of the industry. As mentioned in the literature review, the larger impact of technology on jobs is claimed to be generated through digital tool users, which comprises "Basic ICT users". This includes those who make use of ICTs in their every day job, but also simpler mobile telephone and mobile internet users. It is the employment outcomes of those within and on the fringe of Basic ICT use that are being estimated in this paper, and a comparison is drawn relative to unconnected workers.

Figure 1: Relative scale of possible impact of technology on work, World Bank, 2015.



The range of activities that can be carried out on mobile phones and the internet are integral to deconstructing the impact that these ICTs have on the probability of finding a job. Table 1 below, shows that when the entire sample is looked at collectively, just over half of the sample (54%) owns a mobile phone, and just 15.3% of the sample uses the internet.

Table 1: ICT Ownership and Use 2012 – Entire Sample

Mobile Activities Carried Out		**Internet Use and Activities**	
Criteria	%	Criteria	%
Mobile Phone Ownership	52.7%	Internet Use	15.2%
Basic Activities		**Activities performed on the Internet**	
Calls	99.4%	Email	79.8%
SMS	83.5%	Social Networking	63.7%
Please Call Me/ Missed Calls	83.5%	VOIP	61.3%
Phone as Organiser/ Calendar	50.6%	Obtaining info on goods/services	56.0%
Games	47.7%	Interacting with Govt Organisations	33.8%
Intermediate Activities		Formal learning activities	29.5%
Radio	46.3%	Online shopping	28.1%
Transfer Airtime	41.9%	Internet Banking	23.9%
Photos/Video	39.3%		
International Calls	21.3%		
Send Money (Mobile money)	18.4%		
Advanced Activities			
Browse the internet	17.2%		
Social Networking	16.0%		
Download Apps	15.0%		
SMS to TV or radio	14.7%		
Email	13.5%		
Roaming	5.3%		
VOIP	3.1%		

Of those who do use mobile phones, the activities are split into basic, intermediate and advanced activities. Basic activities include calling, SMSing and functions that can be completed on a basic mobile device. Intermediate activities include additional activities that a feature phone may offer, including using the radio, transferring airtime and making international calls. Browsing the internet and other activities such as roaming, VOIP, email and social networking are considered advanced. These activities were categorized by proportion of use in the population and a consideration of what technologies were widespread at the time of the survey (Khan, Chair and Deen-Swarray, 2012).

Since only 15.3% of the sample uses the internet, it does not make sense to separate the activities by level of complexity. Nevertheless, one can see that like mobile activities, some activities are carried out by more individuals than others. For instance, emailing is conducted by a larger proportion of the internet using population than internet banking.

3.2 Economic Model

Using two models, a logistic regression latent variable model and multinomial regression model, the probability of employment is modeled dependent on the ICT variables and other socioeconomic and demographic characteristics of each individual. The models are specified as follows:

$$\Pr(y_{i,t} \mid X) = G(\beta_0 + X'\beta) \text{ where G is a logistic function} \quad \text{Equation 1 - Simple Logit Model}$$

$$\Pr(y_{i,t} = j \mid X) = G(\beta_0 + X'\beta) \text{ where G is a logistic function and } j = 0, 1, 2. \quad \text{Equation 2 - Multinomial Logit model}$$

yi,t is the employment outcome variable, and it varies between the simple logit model and the multinomial logit model. In the case of the simple logit model (Equation 1), there are two employment outcomes and in the case of the multinomial logit model there are three employment outcomes. These employment outcomes are defined in the table below.

In the case of the simple logit model the employment outcome is simply whether or not an individual holds any form of employment. However, as indicated in the literature review, the potential effects of ICTs on the employment outcomes and nature of work for rural and particularly self-employed individuals tends to be different from those in urban areas and those who are employed by other institutions. This is because agri-based economies consist of many self-employed agrarian workers in rural parts of the country.

Table 2: Employment outcome variables

(1) Simple Logit Model Employment Outcome	(1) Multinomial Logit Employment Outcomes
$y_{i,t}$ *= 0 if individual does not have a job*	$y_{i,t}$ *= 0 if individual does not have a job*
$y_{i,t}$ *= 1 if individual has a job (employed, or self-employed)*	$y_{i,t}$ *= 1 if an individual is a rural & self-employed worker*
	$y_{i,t}$ *= 2 if an individual is a rural & not self-employed worker; or individual is an urban employee (either self-employed or not)*

The probability of the employment outcomes specified in Equations 1 and 2 are conditional on a vector of explanatory variables (X) which contains an individual's sex, age, marital status, geolocation, their education level, and the ICT controls (see Table 3). The size of the effect of an increase in ICT intensity associated with the probability of employment is measured using average marginal effects.

Table 3: Covariates and controls

List of independent (X) variable categories and controls	
Mobile ICT Use (Degrees of advanced usage)	Internet Use
Sex	Years of formal education
Urban/Rural location	Marital status
Age	Country

Deen-Swarray et al. (2015) showed that ICT take-up patterns differ markedly between rural and urban areas. Given this evidence, four model specifications (Table 4), each based on a

unique subpopulation, will be estimated for the employment outcome (Equation 1) to investigate whether the impact of mobile and internet use has differing effects on the employment outcome of different subpopulations. The next section discusses the data and results of this analysis.

Table 4: Simple logits estimated based on heterogeneous sub-populations

Sub-population	Outcome Variable: (Probability of) Employment
1	Whole Population
2	Urban / Rural
3	Male/Female
4	Youth / Non-Youth

3.3 Endogeneity Concerns

Estimating an earnings equation from a survey conducted to measure ICT access and use is not without its challenges, the most concerning of which is endogeneity. The first endogeneity concern is the simultaneous relationship between mobile phone ownership and employment. Even though 46.64% of the unemployed across the entire sample own mobile phones, there is still a strong link between finding a job and thereafter acquiring a mobile phone[1]. Yet those unemployed individuals who own mobiles may face a higher probability of finding a job because of the opportunities the mobile phone affords them. This two-way relationship is the main source of endogeneity. In order to remove such endogeneity, an instrumental variable is required. However, due to data limitations a strong instrument could not be obtained. This shortcoming does not however mean that the results obtained through estimation are uninformative, just that causality cannot be established. The conditional correlations outlined are still informative from a policy purpose.

Second, omitted variables bias for lack of controls such as ability and efficiency of the person applying for work are prevalent; this is likely to bias the coefficient of the mobile phone ownership and use variables upwards.

Finally, the employment outcome in many African countries can be characterized through a two-step decision making process. The first being a choice made by the individual as to whether or not they should be part of the labour force. This step excludes discouraged workers. Once the choice to join the labour force is made, employment, which is the second outcome, is modelled correcting for the bias of those who left the labour force in the first stage. This selection bias associated with the decision of those who choose not to be part of the labour force is not modelled in this paper. This is because the distinction between discouraged workers, and workers who are not part of the labour market, is not drawn in the survey.

[1] 67.22% of employed individuals own mobile phones.

4. DATA AND DESCRIPTIVE STATISTICS

4.1 Data

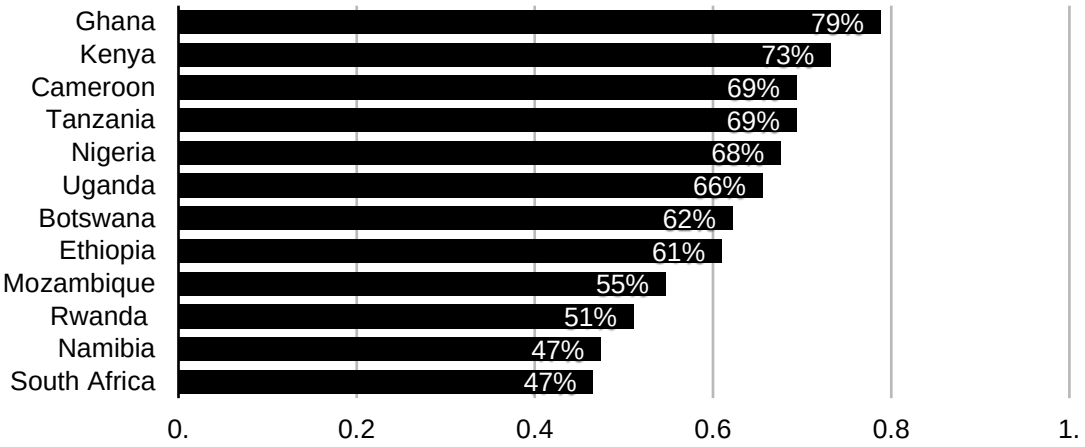
The data used for this study is based on nationally representative cross sectional data collected by Research ICT Africa (RIA) in 12 African countries in the period 2011/2012. This RIA Household Survey Data was sampled using two stage stratified random sampling. First enumerator areas (EA's) were sampled using probability proportional to size, then within each EA households were selected using simple random sampling. Metropolitan, urban and rural areas were all taken into account for the sampling design. One individual (15 years of age or older) from each household was randomly selected to represent the household.

4.2 Descriptive statistics

4.2.1 The employment outcome by country

Figure 2 below presents the proportion of labour force employed for the twelve countries studied for the year 2012. The figures presented include self-employment measures which may inflate the total employment statistic. Figure 2 shows that Ghana has the highest rate of employment from the countries in the sample, and South Africa and Namibia have the lowest employment rates.

Figure 2: Proportion of labour force employed (2012)



The measure of the labour force used does not take into account discouraged workers. This is because the survey is an ICT adoption and use survey, implying that the labour market outcomes are not as detailed as a labour force survey would be. No cross checks were included in the survey design to check the formality of employment, or length of unemployment, and duration of job search.

Table 5 below, breaks down the share of self-employed and other (salaried) employed individuals between rural and urban areas. The share of employed individuals who are self-employed is higher in rural areas in all countries except South Africa and Namibia. This is because subsistence agriculture and employment tend to be higher in rural areas. Since the survey does not account for sector of employment or type of job, this split between rural self-employment and other employment is useful, and is used to model the employment outcome. It shows that for Tanzania, Ethiopia, Uganda and Rwanda, substantially more than half of the employed population is rural and self-employed. In Tanzania, Ethiopia and Cameroon, more than 90% of the employed are self-employed. Alternatively, in countries like Kenya, Namibia, South Africa and Botswana, more than 50% of the population are standard salaried employees. In most countries, self-employment is higher in rural areas, and salaried employment is higher in urban areas.

Table 5: Type of Employment as a share of total employment (2012)

Country	Self-Employed					
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
Tanzania	*95%*	17%	77%	*5%*	4%	1%
Ethiopia	*92%*	11%	81%	*8%*	7%	1%
Cameroon	*90%*	42%	49%	*10%*	8%	2%
Uganda	*78%*	7%	71%	*22%*	6%	16%
Ghana	*75%*	30%	45%	*25%*	16%	9%
Nigeria	*74%*	34%	40%	*26%*	14%	12%
Mozambique	*61%*	15%	46%	*39%*	20%	19%
Rwanda	*58%*	7%	51%	*42%*	16%	26%
Kenya	*42%*	10%	32%	*58%*	10%	48%
Namibia	*26%*	9%	17%	*74%*	35%	39%
South Africa	*22%*	15%	7%	*78%*	59%	19%
Botswana	*11%*	7%	4%	*89%*	60%	30%
Average	**60%**	**17%**	**43%**	**40%**	**21%**	**19%**

4.2.2 Mobile ownership and internet use

The methodology section showed that the average mobile ownership rate across all twelve countries was 54%, but Table 6 below illustrates that mobile ownership rates vary greatly between countries. South Africa has an ownership rate of 84.2% of the population, compared to Ethiopia that has an 18.3% ownership rate. For many countries, the ownership rates differ between men and women – for instance in Uganda, 56.2% of men owned a mobile phone in 2012, compared to only 34.5% of women. Countries like Cameroon and Mozambique have a more egalitarian split of ownership between sex. In general, mobile ownership rates are higher in urban than rural areas.

Table 6: Mobile Ownership by Country, Geolocation and Sex (2012)

Country	Whole Population	Male	Female	Urban	Rural
South Africa	**84.2%**	86.3%	82.4%	86.3%	80.8%
Botswana	**80.0%**	76.1%	82.7%	86.7%	69.4%
Kenya	**74.0%**	83.8%	67.9%	73.2%	74.1%
Nigeria	**66.4%**	76.5%	54.9%	71.5%	61.3%
Ghana	**59.5%**	61.2%	58.2%	74.8%	45.6%
Namibia	**56.1%**	54.9%	57.0%	76.5%	46.1%
Uganda	**46.7%**	56.2%	34.5%	57.8%	45.0%
Cameroon	**44.5%**	44.2%	44.9%	62.6%	19.2%
Mozambique	**42.5%**	42.8%	42.1%	67.1%	29.8%
Tanzania	**35.8%**	41.7%	30.9%	59.1%	27.4%
Rwanda	**24.4%**	27.6%	21.2%	47.0%	17.8%
Ethiopia	**18.3%**	24.8%	10.4%	51.4%	11.3%
Average	***52.7%***	*56.3%*	*48.9%*	*67.8%*	*44.0%*

Mobile penetration is much larger in all countries compared to internet use. Table 7 shows that the country with the highest percentage of the population using the internet in 2012 was South Africa, with a usage rate of 34%. Internet usage rates drop drastically between countries, and are at below 5% of the population in Tanzania and Ethiopia.

There is a larger gender discrepancy in internet use between males and females across all countries compared to mobile phone ownership, perhaps pointing to the fact that men may be early users or have easier access to internet capable devices, than women. Rural areas also lag behind urban areas with respect to internet use.

Table 7: Internet Use by Country, Geolocation and Sex (2012)

Country	Whole Population	Male	Female	Urban	Rural
South Africa	**34.1%**	40.6%	28.6%	41.7%	21.8%
Botswana	**29.0%**	32.6%	26.5%	35.1%	19.3%
Kenya	**26.3%**	35.8%	20.5%	26.0%	26.4%
Nigeria	**18.4%**	22.8%	13.4%	21.8%	15.1%
Namibia	**16.2%**	18.7%	14.2%	37.6%	5.7%
Cameroon	**14.1%**	13.4%	14.7%	22.4%	2.5%
Ghana	**12.7%**	17.8%	8.5%	15.9%	9.7%
Mozambique	**11.1%**	12.6%	9.3%	26.1%	3.3%
Uganda	**7.9%**	11.8%	3.1%	17.3%	6.5%
Rwanda	**6.0%**	6.9%	5.2%	14.7%	3.5%
Tanzania	**3.50%**	3.40%	3.50%	8.50%	1.70%
Ethiopia	**2.70%**	3.90%	1.10%	9.20%	1.30%
Average	***15.20%***	*18.40%*	*12.40%*	*23.00%*	*9.70%*

4.2.3 Patterns of ICT use

To evaluate the differing impacts of mobile phone use and internet use on the employment outcome, mobile phone use was split into categories based on whether the activities conducted were basic, intermediate or advanced (Table 1). Table 8 below highlights different patterns of use based on sex or geolocation.

For basic activities such as calling, SMSing, or sending Call Me Backs there does not seem to be a large difference in patterns of use between men and women, nor between urban and rural areas. For intermediate use such as listening to the radio, transferring airtime, taking photos/videos or sending mobile money, gender gaps and gaps between urban and rural areas start to become more evident. Men conduct more of the activities the more advanced the activity becomes, with the exception of utilising mobile money services. In rural areas, the intermediate activities that are used more include mobile money and airtime transfers. This makes sense since financial infrastructure may be in short supply, and men may have easier access to formal bank accounts.

Table 8: Mobile activities carried out by sex and geolocation (All countries – 2012)

Activity	Female	Male	Urban	Rural
Basic Activities				
Calls	99.4%	99.4%	99.2%	99.6%
SMS	83.9%	83.3%	85.0%	82.1%
Call Me Back/ Missed Calls	82.6%	84.2%	81.8%	85.2%
Phone as Organiser/ Calendar	51.6%	49.7%	51.8%	49.3%
Games	43.6%	51.0%	48.9%	46.4%
Intermediate Activities				
Radio	41.9%	50.0%	49.2%	43.4%
Transfer Airtime	40.5%	43.0%	41.5%	42.3%
Photos/Video	35.8%	42.0%	44.8%	33.7%
International Calls	20.0%	22.3%	25.7%	16.9%
Send Money (Mobile money)	21.6%	15.8%	12.8%	24.0%
Advanced Activities				
Browse the internet	13.4%	20.3%	21.2%	13.3%
Social Networking	12.8%	18.6%	19.2%	12.8%
Download Apps	10.8%	18.4%	17.3%	12.7%
SMS to TV or radio	12.5%	16.5%	15.4%	14.0%
Email	10.5%	15.9%	15.0%	12.0%
Roaming	5.2%	5.3%	5.8%	4.7%
VOIP	2.8%	3.3%	3.5%	2.6%

For more advanced activities mostly related to use of the internet, the gender gap widens. For instance, 18.6% of men use social networking on their phones compared to just 12.8% of women. Men use more internet related activities than women, corroborating the fact that actual internet usage rates are higher for men (Table 7). All advanced activities are used more in urban areas than rural areas.

As discussed in the methodology section, because internet use is prevalent among such a small proportion of the population, it in and of itself is an advanced activity and will be controlled for by using a binary variable for internet use. Nonetheless, it is still interesting to see how the patterns of use differ by sex and geolocation.

Table 9: Activities carried out on the Internet by sex and geolocation (All countries – 2012)

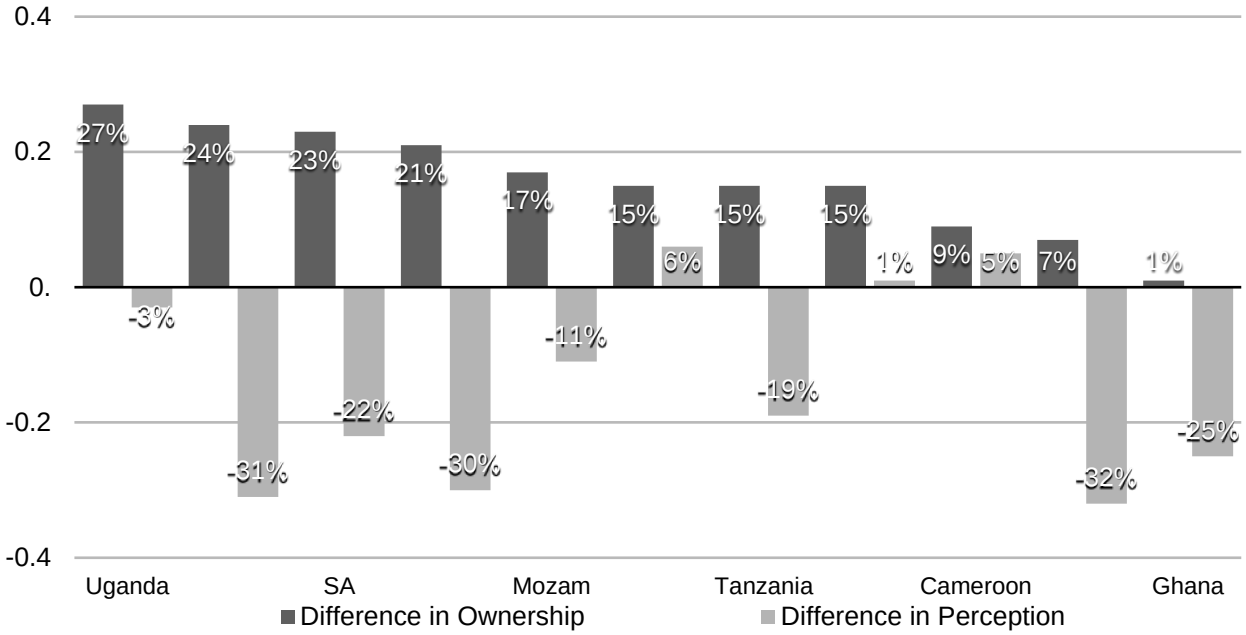
Activity	Female	Male	Urban	Rural
Email	76.2%	82.2%	77.0%	84.8%
Social networking	59.6%	66.4%	65.7%	60.5%
Formal learning activities	59.4%	62.5%	59.3%	64.8%
Getting info on goods and services	45.6%	62.6%	55.5%	56.9%
Accessing government services	24.1%	40.0%	31.1%	38.3%
VOIP	19.9%	35.6%	30.0%	28.6%
Online shopping	19.2%	33.8%	26.7%	30.6%
Internet Banking	16.8%	28.5%	27.5%	17.7%

Overall, the large differences in patterns of use based on sex and geolocation may influence the labour market outcomes of people employed in rural areas compared to urban areas, as well as self-employed compared to non-self-employed individuals. Since the self-employed make up such a large proportion of the employed in most countries studied, and given that most of these self-employed are located in rural areas, it is important to account for this in the structure of the models in order to account for nuanced effects dependent on the nature of these labour forces.

4.2.4 Perceptions of the impact of ICTs on the employment outcome

One interesting thing to look at in conjunction with the actual effect of ICT use on the employment outcome, is the perception of the usefulness of ICTs to finding jobs. Figure 3 shows the difference in mobile phone ownership rates between 2008 and 2012, and differences in the percentage of the population who believed that owning a mobile phone would help them find a job. With the exception of Cameroon, Rwanda and Ethiopia, increases in mobile ownership are associated with a lower proportion of the population that believe mobile phones help them find work. Rwanda and Ethiopia have the lowest overall mobile ownership rates in the sample, and the increase in optimism between 2008 and 2012 could be because the technology is not very wide spread and the large proportion of non-owners may believe that newfound acquisition of a mobile phone may help them find a job. There is no relationship between the size of mobile ownership increases and the size of changes in the perception of mobile ownership helping individuals find jobs.

Figure 3: Perceptions of the impact of ICTs on the employment outcome



5. RESULTS

Tables 10 and 11 present a summary of the countries that showed evidence of a correlation between ICT use and the employment outcome.

Table 10 presents the results of Model 1 (Equation 1) that looks at the relationship between employment (all types) and ICTs. The models were estimated for the entire population, then for the urban, rural, male, female, and youth and non-youth subpopulations, respectively.

Mobile ownership is seen to have a positive impact on the probability of employment in Uganda, Cameroon, Namibia and Mozambique – four out of the eleven countries studies[2]. However, splitting the sample by sub-population changes this result dramatically: the probability of employment is positively affected by mobile ownership in the urban areas of six countries, more so for males than females, and more so for the older population in a larger number of countries. Put differently, owning a mobile phone is likely to increase the probability of employment of rural individuals only in Ghana, of female individuals only in Cameroon, and of the younger population only in Namibia. In Uganda, owning a mobile phone as an under 25 is associated with a lower probability of finding a job.

[2] Rwanda was omitted from the estimation due to small sample size.

Table 10: Countries showing significant effects of the impact of ICTs on the probability of employment.

Simple Logit Models (2012)							
Variable	**Whole Population**	**Sub-population**					
		Urban	**Rural**	**Male**	**Female**	**Youth**	**Non-Youth**
Own a Mobile	Uganda* Ghana* Cameroon** Namibia* Mozambique*	Uganda* Cameroon* Nigeria* Namibia** Mozambique** Botswana**	Ghana**	Uganda* Ghana* Mozambique*	Cameroon**	Namibia* Uganda(-)*	Uganda* Ghana* Cameroon* Nigeria* Namibia*
Intermediate	Kenya* South Africa* Botswana*	-	Botswana*	South Africa*** Botswana*	-	Uganda** South Africa* Ethiopia(-)* Namibia(-)*	Kenya** Botswana*
Advanced	Kenya* South Africa* Botswana**	-	Kenya*** South Africa* Botswana*	Botswana***	South Africa*	South Africa*	Botswana*
Internet	South Africa*	Tanzania* South Africa* Kenya(-)*	-	South Africa* Kenya(-)* Ghana(-)* Nigeria(-)*	Cameroon(-)**	Tanzania* Cameroon(-)*	South Africa* Kenya(-)* Ethiopia(-)*

*Notes: ***p<0.01, **p<0.05, *p<0.1*

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities.

The results are equally varied for the types of mobile phone activities carried out: intermediate and advanced mobile phone use is associated with a higher probability of employment in Kenya, South Africa and Botswana, relative to basic users. In urban areas, the sophistication of mobile activities conducted has no impact on the probability of employment. In Namibia and Ethiopia, advanced use is associated with a lower probability of employment. For most countries, the level of mobile phone use by sex and age do not affect the probability of employment, although in Uganda and South Africa mobile phone savvy is likely to increase the probability of employment of those under 25.

Internet use is largely associated with no significant impact on the probability of employment, bar South Africa and Tanzania, who show weak evidence of internet use leading to increases in the likelihood of employment.

A few of the marginal effects presented in Table 10 are negative, indicating that ICT use in those countries and subpopulations may be associated with a decrease in the likelihood of finding a job. However, it is important to note that the correlation between ICTs and employment is tenuous. The coefficients presented, where significant, are generally only significant at the 10% or 5% level. What the negative coefficients may be capturing is an already high level of unemployment among those groups, coupled with relatively higher or growing rates of ICT use.

Table 10 above considers employment as a simple binary outcome, however the literature showed that the impact of ICTs on employment may vary dependent on the type of work being done. Table 11 below shows the impact of ICTs on the probability of employment of those who are self-employed in rural areas, and all other forms of employment.

Table 11: Countries showing significant effects of the impact of ICTs on the probability of employment.

Multinomial Logit Models (2012).							
Variable	**Whole Population**	**Sub-population**					
		Urban	**Rural**	**Male**	**Female**	**Youth**	**Non-Youth**
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	Tanzania*	-	-	Cameroon***	Ghana*	-	Ghana*
Intermediate	Tanzania (-)* Ghana (-)*	-	-	Cameroon(-)**	Ghana(-)*	Ethiopia(-)*** Namibia(-)** South Africa(-)***	Tanzania(-)* Ghana(-)*
Advanced	Ethiopia*** Tanzania(-)* Ghana(-)*	-	Nigeria(-)*	Ethiopia*** Cameroon(-)***	Ghana(-)**	-	Ghana(-)*
Internet	Kenya(-)** Ethiopia(-)** Namibia(-)* Botswana(-)*	-	Kenya(-)** Namibia(-)**	Ethiopia(-)*** Kenya(-)***	Uganda* Namibia(-)** Botswana(-)**	Namibia*	Kenya(-)** Nigeria(-)* Namibia(-)** Botswana(-)***
Outcome 2: Employed (Other)							
Own a Mobile	Ghana *** Namibia* South Africa*	Ghana** Namibia** South Africa ** Mozambique* Botswana*	Ghana*	Nigeria*	Ghana* Namibia* South Africa**	-	Ghana** Nigeria* Namibia** South Africa*
Intermediate	Uganda* Kenya** South Africa *** Botswana*	Kenya** South Africa**	Botswana*** Ethiopia(-)*	South Africa***	Uganda* Botswana*	-	Uganda* Kenya** Tanzania* SouthAfrica* Botswana*
Advanced	Kenya*** South Africa*** Botswana*	Kenya*** South Africa*	Kenya* South Africa** Botswana***	Ethiopia** South Africa**	Kenya** South Africa* Botswana*	-	Kenya*** South Africa** Botswana*
Internet	Tanzania*	Kenya**	Tanzania(-)**	-	-	Cameroon(-)*	Mozambique*

*Notes: ***p<0.01, **p<0.05, *p<0.1*

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities.

Separating the employment outcome between rural self-employed and other shows that for Tanzania, Cameroon and Ghana, mobile ownership is associated with a higher probability of self-employment for those in rural areas. In Cameroon, rural men who own mobile phones face a positive and significant probability of finding self-employment in rural areas. The same holds for women and older individuals in Ghana.

Aside from mobile ownership, the activities used on mobile phones and internet use are either not significant, or associated with a negative impact on the probability of self-employment in rural areas. This correlation could possible reflect the growing use of technologies among those who are unemployed.

Considering the other types of employment, Table 11 shows that the results first presented in the simple logit models still hold, but for more countries, implying that the rural self-employed may have been skewing the results. Table 11 shows that in a selection of countries, namely; Tanzania, Uganda, Kenya, South Africa, Botswana, Namibia and Ghana, there are persistent effects of ICT use on the probability of employment, and of these, the most impactful is owning a mobile phone. For instance, owning a mobile phone is associated with an increased probability of other employment in Ghana, Namibia, and South Africa, with significant effects in urban areas, among females, and among non-youth. Further, intermediate and advanced activities carried out on mobile phones increase the probability of employment compared to those conducting basic activities for Kenya, South Africa, and Botswana.

The results change however when we consider internet use. Kenya and Tanzania are the only countries who show an association between internet use and employment. However, this association is quite weak (significant at the 10% level) and may not be robust.

Table 11 also shows that, for employment that is not rural self-employment, ICTs have no impact on the probability of young people finding a job in any of the countries considered. This is interesting since it may be illuminating structural challenges faced by young people when it comes to entering the job market.

The results show that for a handful of countries, there seems to be evidence of a positive association between any form of employment that does not include rural self-employment and ICTs. What this association means for policy, is discussed in the conclusion.

6. POLICY IMPLICATIONS AND CONCLUSION

What this paper shows is that the contexts of the various countries studied vary greatly from each other. Some countries exhibit a positive impact of ICTs on employment, but this effect is only seen for forms of employment that do not include rural self-employment. The range of countries that show significance of ICTs on employment is limited, illustrating that there is not a standard policy that will help countries realise the potential impact of ICTs on employment. Instead, there is a susceptibility of certain countries and subpopulations for the potential of ICTs to aid the employment outcome.

For instance, mobile ownership is associated with a higher probability of (other) employment for females in three countries, and the non-youth in four countries. Policy can be drafted to target these groups specifically so that the susceptibility of ICTs to influence the employment outcome can be realised. For such interventions it may be useful to conduct focus groups or ethnographic studies in those countries to identify context specific policies.

What the results also demonstrate is that the countries that show potential for ICTs to be effective are not necessarily the countries with the highest employment rates. Instead, for countries like South Africa, Botswana and Kenya, where the impact of intermediate and

advanced mobile activity use over basic use influences the employment outcome, there are instead high mobile penetration rates. This strengthens the argument for expanding universal access to services, however, while universal access is a necessary condition it is by no means the end of ICT policy.

The impact of intermediate and advanced levels of mobile use were persistently significant for the non-youth in Uganda, Kenya, South Africa and Botswana. Since much of this advanced use is internet based, local content generation will become increasingly important in stimulating social outcomes such as job creation.

Further, local content generation may assist in aiding employment outcomes for the youth – for whom ICTs had almost no impact in assisting the employment outcome – since it provides young people with opportunities to discuss topics related to health, education, jobs and entertainment with their peers (GSMA, 2014). This, coupled with the growth in social networking, public wifi and smartphone prevalence, allows for platforms for user-generated content related to employment and entrepreneurship.

Finally, there are countries that show no significance of the impact of ICTs on employment. This may be because these countries are lagging in terms of infrastructure and penetration, and may not yet have reached the critical masses required to see positive impacts of ICTs on the employment outcome. This holds true in particular for internet related activities where no impact on employment was seen for all countries except Tanzania.

Finally, it is important to bear in mind that ICTs in and of themselves are no panacea to solving employment outcomes. While they hold the potential for effective impact on employment, there is no replacement for skills and training, and networks. This may be alluded to in what was observed with networking effects among ICTs impacting the employment outcomes of older members of the population in Kenya, South Africa, Uganda and Botswana.

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APPENDIX

Appendix A

Table A1: Employment by geolocation and sex (2012)							
Country	Whole Population		Urban Subpopulation		Rural Subpopulation		Total employment rate
	Male	Female	Male	Female	Male	Female	
Ghana	87.4%	72.5%	88.5%	70.6%	86.4%	74.4%	**78.8%**
Kenya	89.6%	63.2%	94.1%	65.3%	88.8%	62.6%	**73.2%**
Cameroon	90.1%	50.1%	86.1%	45.1%	93.7%	58.5%	**69.4%**
Tanzania	86.8%	56.4%	86.0%	47.3%	87.1%	60.0%	**69.3%**
Nigeria	90.1%	42.4%	88.9%	46.0%	91.0%	38.1%	**67.6%**
Uganda	86.1%	42.6%	86.4%	42.1%	86.1%	42.7%	**65.5%**
Botswana	74.1%	54.2%	82.5%	57.9%	58.1%	49.4%	**62.1%**
Ethiopia	84.4%	32.7%	90.5%	54.6%	83.4%	27.4%	**61.0%**
Mozambique	73.4%	35.9%	79.2%	43.4%	70.6%	33.1%	**54.6%**
Rwanda	58.0%	44.7%	52.5%	50.9%	60.0%	43.2%	**51.1%**
Namibia	59.6%	38.7%	78.3%	57.2%	50.5%	30.4%	**47.4%**
South Africa	65.0%	31.1%	75.2%	37.1%	46.9%	20.9%	**46.5%**

Appendix B – Simple Logit Models

Table B1: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Uganda

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	**0.147***	**0.260***	0.138	**0.119***	0.153	-0.258	**0.173***
	-0.077	-0.125	-0.085	-0.072	-0.126	-0.059	-0.085
Intermediate	0.056	0.057	0.048	0.060	0.043	0.545	0.027
	-0.074	-0.102	-0.081	-0.055	-0.135	-0.119	-0.075
Advanced	-0.044	-0.068	-0.052	0.076	-0.146	0.359	-0.083
	-0.065	-0.083	-0.077	-0.048	-0.097	-0.146	-0.081
Internet	0.124	0.035	0.170	-0.029	0.278	0.044	0.173
	-0.088	-0.071	-0.128	-0.114	-0.127	-0.171	-0.088
N	942	550	392	471	471	193	749

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B2: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Kenya

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	*-0.101*	*-0.109*	-0.108	*-0.095*	-0.041	0.177	*-0.150*
	-0.082	-0.111	-0.097	-0.036	-0.187	-0.245	-0.070
Intermediate	**0.141***	0.117	0.161	0.135	0.079	-0.158	0.233**
	-0.064	-0.095	-0.077	-0.080	-0.206	-0.206	-0.080
Advanced	**0.221***	0.086	**0.303*****	0.160	0.212	-0.100	**0.290*****
	-0.073	-0.100	-0.051	-0.067	-0.173	-0.219	-0.061
Internet	-0.124	-0.090	-0.209	-0.173*	-0.004	0.096	**-0.209***
	-0.108	-0.030	-0.109	-0.077	-0.110	-0.170	-0.092
N	1,057	731	326	421	636	218	839

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B3: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Tanzania

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	0.100	-0.020	0.184		0.076	0.822	*0.031*
	-0.072	-0.088	-0.108		-0.113	-0.821	-0.059
Intermediate	-0.092	0.081	-0.228		-0.031	-0.375	-0.072
	-0.079	-0.103	-0.145		-0.098	-0.825	-0.083
Advanced	-0.091	0.119	-0.318		-0.051	-0.877	-0.073
	-0.083	-0.078	-0.165		-0.125	-0.932	-0.097
Internet	0.154	**0.295***	0.081		0.160	**3.658***	0.059
	-0.083	-0.091	-0.106		-0.148	-1.454	-0.115
N	1,082	653	429		645	244	838

****p<0.01, **p<0.05, *p<0.1*
Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B4: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Ethiopia

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	0.093	0.004		*0.052*	-0.051	0.231	*0.016*
	-0.060	-0.055		-0.047	-0.082	-0.171	-0.061
Intermediate	-0.091	0.038		-0.065	-0.006	-0.243*	0.039
	-0.055	-0.057		-0.045	-0.089	-0.067	-0.061
Advanced	0.061	0.149		0.002	0.214	-0.040	0.042
	-0.071	-0.063		-0.053	-0.218	-0.179	-0.067
Internet	-0.149	-0.039		-0.079	0.362	-0.076	**-0.169***
	-0.082	-0.116		-0.056	-0.350	-0.158	-0.088
N	1,357	778		656	701	239	1,118

****p<0.01, **p<0.05, *p<0.1*
Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B5: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Ghana

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	**0.114***	*0.089*	**0.170****	***0.162****	0.122	0.025	**0.132***
	-0.052	-0.087	-0.045	-0.095	-0.062	-0.137	-0.057
Intermediate	0.073	0.095	-0.005	0.019	0.085	0.259	0.050
	-0.057	-0.060	-0.082	-0.075	-0.072	-0.141	-0.057
Advanced	0.077	0.146	-0.054	0.046	0.110	0.211	0.077
	-0.064	-0.064	-0.149	-0.069	-0.095	-0.162	-0.057
Internet	-0.088	-0.099	-0.161	**-0.175***	0.051	-0.224	-0.028
	-0.105	-0.135	-0.221	-0.100	-0.135	-0.161	-0.095
N	982	585	397	415	567	135	847

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B6: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Cameroon

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	**0.194****	**0.239***		0.035	**0.324****	0.347	***0.154****
	-0.061	-0.083		-0.053	-0.102	-0.136	-0.057
Intermediate	-0.054	-0.079		0.009	-0.094	-0.221	-0.032
	-0.060	-0.066		-0.053	-0.102	-0.187	-0.058
Advanced	-0.049	-0.078		-0.060	-0.034	-0.111	-0.068
	-0.044	-0.048		-0.094	-0.092	-0.184	-0.047
Internet	-0.052	-0.017		0.068	**-0.166***	**-0.160***	-0.020
	-0.049	-0.054		-0.040	-0.062	-0.074	-0.063
N	985	665		459	526	219	766

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B7: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Nigeria

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	0.083	**0.146***	0.044	0.014	0.086	-0.054	**0.0968***
	-0.060	-0.059	-0.069	-0.057	-0.075	-0.114	-0.047
Intermediate	0.043	-0.035	0.108	0.004	0.139	0.098	0.058
	-0.065	-0.055	-0.079	-0.052	-0.081	-0.119	-0.055
Advanced	0.011	-0.027	-0.017	0.061	-0.075	0.095	0.024
	-0.068	-0.055	-0.105	-0.054	-0.098	-0.165	-0.073
Internet	-0.030	0.018	-0.064	-0.075	0.066	0.151	-0.111
	-0.056	-0.078	-0.076	-0.038	-0.087	-0.105	-0.075
N	1,329	770	559	703	626	229	1,100

****p<0.01, **p<0.05, *p<0.1*
Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B8: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Namibia

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	**0.220***	**0.285****	0.184	*0.297*	0.236	**0.292***	**0.205***
	-0.087	-0.101	-0.125	-0.155	-0.109	-0.107	-0.093
Intermediate	-0.062	-0.102	-0.008	-0.066	-0.095	**-0.375****	0.007
	-0.080	-0.062	-0.128	-0.137	-0.111	-0.091	-0.083
Advanced	0.050	0.023	0.116	-0.004	-0.005	-0.169	0.122
	-0.091	-0.093	-0.171	-0.158	-0.113	-0.108	-0.089
Internet	-0.082	-0.008	-0.201	0.056	-0.124	0.182	-0.142
	-0.084	-0.081	-0.133	-0.128	-0.072	-0.184	-0.069
N	728	490	238	322	406	110	618

****p<0.01, **p<0.05, *p<0.1*
Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B9: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – South Africa

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	0.092	0.162	0.017	0.072	0.089	-0.007	*0.112*
	-0.066	-0.090	-0.092	-0.064	-0.102	-0.155	-0.072
Intermediate	**0.0770***	0.060	0.066	**0.155*****	0.021	**0.272***	0.046
	-0.032	-0.043	-0.052	-0.038	-0.054	-0.089	-0.039
Advanced	**0.149***	0.104	**0.199***	0.047	**0.226***	**0.309***	0.104
	-0.060	-0.075	-0.089	-0.092	-0.095	-0.118	-0.074
Internet	**0.142***	**0.143***	0.176	**0.242***	0.059	0.040	0.179*
	-0.067	-0.068	-0.135	-0.087	-0.074	-0.097	-0.079
N	1,256	858	398	566	690	206	1,050

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B10: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Mozambique

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	**0.160***	**0.283****	0.066	**0.236***	0.093	0.120	*0.148*
	-0.075	-0.103	-0.087	-0.085	-0.102	-0.283	-0.080
Intermediate	-0.016	-0.202	0.135	-0.117	0.033	0.148	-0.034
	-0.119	-0.120	-0.168	-0.176	-0.134	-0.307	-0.142
Advanced	0.009	-0.059	0.079	0.020	-0.006	0.100	0.029
	-0.091	-0.116	-0.127	-0.131	-0.123	-0.294	-0.086
Internet	0.176	0.166	0.083	0.085	0.238	0.048	0.225
	-0.087	-0.104	-0.094	-0.119	-0.158	-0.149	-0.110
N	929	525	404	497	432	189	740

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table B11: Countries showing significant effects of the impact of ICTs on Probability of Employment Simple Logit Models (2012) – Botswana

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Own a Mobile	0.058	**0.215****	-0.092	0.086	0.032	0.116	0.026
	-0.072	-0.083	-0.097	-0.059	-0.093	-0.122	-0.075
Intermediate	**0.131***	0.045	**0.259***	**0.145***	0.105	0.095	0.125*
	-0.055	-0.069	-0.085	-0.064	-0.075	-0.110	-0.058
Advanced	**0.251****	0.123	**0.411****	**0.232*****	0.241	0.159	**0.244***
	-0.076	-0.108	-0.111	-0.053	-0.115	-0.141	-0.086
Internet	-0.056	0.006	-0.098	-0.089	-0.011	-0.137	-0.036
	-0.047	-0.064	-0.052	-0.051	-0.075	-0.090	-0.064
N	800	536	264	361	439	107	693

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Appendix C – Multinomial Logit Models

Table C1: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Uganda

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.0223	-0.076	0.050	0.014	0.047	-0.274	0.048
	(0.58)	(-1.06)	(0.51)	0.270	0.850	(-0.00)	1.160
Intermediate	-0.008	-0.094	-0.035	-0.009	-0.026	0.358	-0.037
	(-0.19)	(-1.56)	(-0.33)	-0.170	-0.450	0.00	-0.790
Advanced	-0.038	0.003	-0.100	-0.062	-0.023	0.388	-0.069
	(-0.84)	(0.05)	(-0.82)	-0.950	-0.360	0.00	-1.440
Internet	0.000	-0.038	0.071	-0.035	**0.162***	-0.115	0.021
	0.00	(-0.78)	(0.59)	-0.610	(2.01)	(-1.23)	0.440
Outcome 2: Employed (Other)							
Own a Mobile	0.0543	0.076	-0.004	0.091	0.011	0.160	0.038
	(1.10)	(1.06)	(-0.04)	1.430	0.150	0.00	0.740
Intermediate	**0.106***	0.094	0.152	0.053	**0.158***	-0.027	**0.110***
	(2.27)	(1.56)	(1.52)	0.980	(2.08)	(-0.00)	(2.22)
Advanced	0.052	-0.003	0.194	0.103	0.014	-0.199	0.082
	(1.03)	(-0.05)	(1.56)	1.570	0.180	(-0.00)	1.560
Internet	0.042	0.038	0.050	-0.008	0.028	0.145	0.039
	(1.01)	(0.78)	(0.72)	-0.150	0.490	(1.15)	0.930

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C2: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Kenya

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.008	0.035	0.044	0.028	0.001	-0.037	0.014
	(0.20)	(0.67)	0.310	0.430	0.010	-0.500	0.240
Intermediate	-0.013	**-0.156****	-0.058	0.024	-0.021	0.056	-0.024
	(-0.30)	(-3.08)	-0.430	0.330	-0.420	0.770	-0.420
Advanced	-0.015	**-0.198*****	-0.072	0.028	-0.033	0.014	-0.023
	(-0.35)	(-3.54)	-0.480	0.370	-0.600	0.130	-0.410
Internet	**-0.066****	0.095	**-0.222*****	**-0.085*****	-0.035	-0.044	**-0.067****
	(-3.26)	(1.57)	(-3.42)	(-3.41)	-0.970	-0.630	(-3.05)
Outcome 2: Employed (Other)							
Own a Mobile	-0.042	-0.035	-0.096	-0.060	0.008	0.110	-0.068
	(-0.73)	(-0.67)	-0.610	-0.870	0.080	0.890	-1.020
Intermediate	**0.162****	**0.156****	0.216	0.099	0.149	0.094	**0.164****
	(3.04)	(3.08)	1.600	1.300	1.810	0.780	(2.74)
Advanced	**0.238*****	**0.198*****	**0.341***	0.112	**0.284****	0.173	**0.226*****
	(4.00)	(3.54)	(2.10)	1.240	(3.19)	1.110	(3.35)
Internet	-0.071	0.095	0.028	-0.036	-0.104	-0.118	-0.052
	(-1.40)	(1.57)	(0.34)	-0.520	(-1.49)	-1.180	-0.890

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C3: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Tanzania

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	**0.072***	0.011	0.254	0.101	0.069	0.081	0.061
	(2.25)	(0.19)	1.790	0.030	1.530	(.)	(1.56)
Intermediate	**-0.139****	-0.062	-0.615	-0.313	-0.075	-0.103	-0.155*
	(-2.66)	(-1.06)	-0.800	-0.040	-1.140	(.)	(-2.25)
Advanced	**-0.140***	-0.104	-0.666	-0.071	**-0.127***	-0.223	-0.159
	(-2.00)	(-1.71)	-1.270	0.000	(-1.96)	(.)	(-1.79)
Internet	0.032	**-0.221****	0.060	0.029	0.031	0.360	-0.004
	(0.66)	(-3.15)	0.480	0.000	(0.46)	(.)	(-0.06)
Outcome 2: Employed (Other)							
Own a Mobile	-0.014	0.011	-0.164	-0.111	0.005	0.171	-0.075
	(-0.36)	(0.19)	-0.52	(-0.05)	0.090	(.)	(-1.84)
Intermediate	0.073	-0.062	0.772	0.318	0.022	-0.068	**0.131***
	(1.57)	(-1.06)	0.36	(0.04)	0.390	(.)	(2.09)
Advanced	0.103	-0.104	0.858	0.0826	0.114	-0.080	**0.179***
	(1.85)	(-1.71)	0.53	0.00	1.680	(.)	(2.29)
Internet	**0.122***	**-0.221****	**-0.020****	0.0687	0.132	0.052	0.088
	(2.40)	(-3.15)	(-3.01)	0.00	1.610	(.)	(1.34)

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C4: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Ethiopia

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.027	-0.025	0.104	0.030	-0.162	0.113	-0.031
	(0.78)	(-0.65)	1.210	1.330	-0.090	1.340	-0.890
Intermediate	-0.054	-0.010	-0.188	-0.067	0.235	**-0.126*** **	0.132
	(-0.92)	(-0.23)	-1.340	-0.900	0.530	(-8.03)	0.410
Advanced	**0.156*** **	-0.101	0.365	**0.064*** **	0.311	-0.070	0.001
	(22.67)	(-1.61)	(0.07)	(7.56)	(0.02)	0.000	0.000
Internet	**-0.266*** **	-0.013	-0.624	**-0.414*** **	0.125	-0.029	-0.290
	(-21.13)	(-0.16)	(-1.48)	(-7.24)	(0.01)	0.000	-0.190
Outcome 2: Employed (Other)							
Own a Mobile	0.021	-0.025	0.014	-0.022	0.072	0.024	0.017
	(0.94)	(-0.65)	0.960	-1.330	0.060	0.330	0.770
Intermediate	0.000	-0.010	**-0.006***	0.044	-0.021	0.012	0.001
	0.00	(-0.23)	(-2.00)	(1.13)	(-0.21)	0.160	0.000
Advanced	0.050	-0.101	-0.004	**0.040** **	-0.007	0.130	0.036
	(1.34)	(-1.61)	(-0.00)	(2.60)	(-0.00)	0.010	0.020
Internet	0.015	-0.013	-0.005	0.004	0.125	-0.029	0.065
	(0.27)	(-0.16)	(-0.01)	(0.05)	(0.01)	0.000	0.350

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C5: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Ghana

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.041	**-0.169****	0.087	-0.005	0.065*	-0.242	**0.060***
	(1.74)	(-2.93)	(1.40)	(-0.14)	(2.23)	-0.020	(2.49)
Intermediate	**-0.076***	-0.019	-0.170	-0.0264	**-0.107***	0.167	**-0.093***
	(-2.29)	(-0.44)	(-1.78)	(-0.60)	(-2.45)	0.020	(-2.49)
Advanced	**-0.126***	-0.049	-0.309	-0.0473	**-0.163****	0.161	**-0.141***
	(-2.00)	(-0.86)	(-1.83)	(-0.51)	(-2.62)	0.000	(-2.04)
Internet	-0.044	0.106	-0.0989	-0.118	0.054	0.172	-0.065
	(-0.61)	(1.48)	(-0.51)	(-1.01)	(0.79)	0.230	(-0.79)
Outcome 2: Employed (Other)							
Own a Mobile	**0.128*****	**-0.169****	0.083**	0.189*	**0.116***	0.281	**0.102****
	(3.43)	(-2.93)	(3.01)	(2.39)	(2.53)	(0.18)	(2.72)
Intermediate	0.037	-0.019	0.026	0.018	0.033	0.082	0.026
	(1.15)	(-0.44)	0.810	0.350	0.770	(0.02)	0.780
Advanced	0.072	-0.049	0.047	0.020	0.100	0.016	0.114
	(1.39)	(-0.86)	0.770	0.250	1.460	0.00	1.930
Internet	-0.093	0.106	-0.021	-0.047	-0.101	-0.116	**-0.116***
	(-1.94)	(1.48)	-0.420	-0.620	-1.440	(-0.86)	(-2.02)

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C6: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Cameroon

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.030	-0.123		**0.084*** **	-0.151	0.144	0.022
	(0.58)	(-1.78)		(9.15)	0.000	0.000	0.430
Intermediate	0.003	-0.037		**-0.290*** **	0.155	-0.196	-0.006
	(0.05)	(-0.59)		(-28.12)	0.000	-0.020	-0.090
Advanced	-0.048	0.032		**-0.319*** **	0.137	-0.169	-0.085
	(-0.57)	(0.43)		(-31.02)	0.010	0.000	-0.960
Internet	-0.048	0.046		-0.115	0.130	0.084	-0.061
	(-0.63)	(0.84)		(-0.86)	1.010	0.000	-0.700
Outcome 2: Employed (Other)							
Own a Mobile	0.084	-0.123		-0.034	0.163	0.146	0.070
	(1.75)	(-1.78)		-0.640	0.010	(1.40)	1.330
Intermediate	0.036	-0.037		0.150	0.032	0.037	0.033
	(0.82)	(-0.59)		1.630	0.000	(0.07)	0.690
Advanced	0.000	0.032		0.132	-0.017	0.097	-0.023
	(-0.00)	(0.43)		1.170	0.000	(0.80)	-0.370
Internet	-0.036	0.046		0.085	-0.096	**-0.152***	0.007
	(-0.91)	(0.84)		1.050	-1.830	(-2.46)	0.140

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C7: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Nigeria

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.024	-0.057	0.048	0.012	0.037	0.069	0.015
	(.)	(-1.39)	0.880	0.360	1.130	(.)	0.620
Intermediate	-0.003	-0.055	-0.017	-0.025	0.018	-0.106	0.006
	(.)	(-1.59)	-0.260	-0.710	0.410	(.)	0.210
Advanced	-0.053	-0.017	**-0.221***	-0.048	-0.063	-0.195	-0.024
	(.)	(-0.34)	(-1.99)	-0.820	-0.990	(.)	-0.550
Internet	-0.032	-0.009	0.008	-0.036	-0.032	0.267	**-0.091***
	(.)	(-0.19)	0.100	-0.740	-0.500	(.)	(-1.98)
Outcome 2: Employed (Other)							
Own a Mobile	0.057	-0.057	0.059	**0.145***	0.025	0.069	**0.072***
	(.)	(-1.39)	1.730	(2.52)	0.620	(.)	(2.28)
Intermediate	0.030	-0.055	-0.015	-0.042	0.065	0.172	0.013
	(.)	(-1.59)	-0.470	-0.980	1.720	(.)	0.480
Advanced	-0.014	-0.017	-0.047	-0.076	-0.001	0.030	-0.002
	(.)	(-0.34)	-1.280	-1.410	-0.010	(.)	-0.060
Internet	0.068	-0.009	0.125	0.059	0.106	0.087	0.056
	(.)	(-0.19)	1.880	1.330	1.840	(.)	1.290

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C8: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Namibia

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.000	**-0.244****	0.002	0.003	0.016	0.228	0.006
	(0.01)	(-2.92)	0.020	0.070	0.480	1.590	0.170
Intermediate	0.015	0.092	0.045	-0.004	0.014	**-0.328****	0.013
	(0.48)	(1.45)	0.480	-0.090	0.420	(-2.61)	0.370
Advanced	0.038	-0.052	0.110	0.026	0.038	-0.154	0.057
	(0.65)	(-0.69)	0.610	0.320	0.520	-1.240	0.760
Internet	**-0.033***	0.012	**-0.106***	0.009	**-0.047*****	**0.360***	**-0.044****
	(-2.04)	(0.21)	(-2.35)	(0.13)	(-4.13)	(2.19)	(-2.82)
Outcome 2: Employed (Other)							
Own a Mobile	**0.210****	**-0.244****	0.156	0.199	**0.203***		**0.191****
	(3.18)	(-2.92)	1.400	1.590	(2.51)		(2.69)
Intermediate	-0.093	0.092	-0.051	-0.034	-0.114		-0.044
	(-1.69)	(1.45)	-0.460	-0.380	-1.570		-0.770
Advanced	0.029	-0.052	0.038	0.015	0.061		0.066
	(0.42)	(-0.69)	0.240	0.140	0.670		0.920
Internet	0.009	0.012	-0.088	0.056	-0.031		-0.039
	(0.17)	(0.21)	-0.720	0.670	-0.440		-0.720

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C9: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – South Africa

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.004	**-0.179****	0.013	0.012	-0.009	0.019	0.000
	(0.30)	(-2.92)	0.350	0.620	-0.460	0.200	0.000
Intermediate	-0.003	**-0.107****	-0.012	-0.001	-0.004	**-0.014*****	-0.002
	(-0.36)	(-2.74)	-0.380	-0.090	-0.310	(-1282.04)	-0.160
Advanced	-0.020	**-0.148***	-0.060	-0.036	-0.005	-0.024	-0.024
	(-1.43)	(-2.52)	-1.410	-1.730	-0.220	-0.010	-1.600
Internet	0.028	-0.098	0.086	0.057	0.006	0.034	0.034
	(0.93)	(-1.88)	0.910	1.070	0.210	0.010	0.920
Outcome 2: Employed (Other)							
Own a Mobile	**0.108***	**-0.179****	0.014	0.014	**0.196****	-0.002	**0.126***
	(2.35)	(-2.92)	0.210	0.230	(3.20)	-0.010	(2.54)
Intermediate	**0.106*****	**-0.107****	0.090	**0.156*****	0.068	0.135	**0.099****
	(3.37)	(-2.74)	1.670	(3.68)	1.580	1.380	(3.03)
Advanced	**0.182*****	**-0.148***	**0.274****	**0.176****	**0.167***	0.217	**0.164****
	(3.57)	(-2.52)	(2.60)	(2.92)	(2.16)	0.120	(2.97)
Internet	0.060	-0.098	-0.023	0.017	0.095	0.087	0.070
	(1.26)	(-1.88)	-0.230	0.240	1.420	0.050	(1.34)

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C10: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Mozambique

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	0.014	**-0.180***	0.044	-0.001	0.024	-0.153	0.023
	(0.27)	(-2.11)	0.370	-0.010	0.490	-0.010	0.440
Intermediate	0.072	0.078	0.163	0.029	0.106	0.424	0.064
	(1.18)	(0.93)	1.030	0.250	1.340	0.020	1.040
Advanced	0.048	-0.064	0.083	0.093	-0.026	0.397	0.035
	(0.79)	(-0.74)	0.570	0.900	-0.450	0.010	0.550
Internet	-0.046	-0.107	-0.083	-0.090	0.011	-0.044	-0.096
	(-0.80)	(-1.63)	-0.570	-1.160	0.110	-0.670	-1.480
Outcome 2: Employed (Other)							
Own a Mobile	0.103	**-0.180***	-0.017	0.190	0.015	0.030	0.091
	(1.68)	(-2.11)	-0.170	1.770	0.190	0.000	1.430
Intermediate	-0.036	0.078	0.080	0.010	-0.076	0.105	-0.065
	(-0.65)	(0.93)	0.530	0.110	-1.010	0.000	-1.120
Advanced	0.047	-0.064	0.040	-0.011	0.110	0.119	0.040
	(0.76)	(-0.74)	0.300	-0.120	1.140	0.010	0.620
Internet	0.109	-0.107	0.209	0.112	0.110	0.007	**0.159***
	(1.92)	(-1.63)	1.590	1.270	1.460	(0.07)	(2.24)

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

Table C11: Average Marginal Effects of ICTs on Probability of Employment Multinomial Logit Model (2012) – Botswana

Variable	Whole Population	Sub-population					
		Urban	Rural	Male	Female	Youth	Non-Youth
Outcome 1: Self-Employed in Rural Areas							
Own a Mobile	-0.012	**-0.186***	-0.019	0.012	-0.016	0.000	-0.013
	(-0.50)	(-2.39)	-0.300	0.420	-0.550	0.000	-0.530
Intermediate	0.013	-0.023	0.025	-0.001	0.010	-0.017	0.016
	(0.64)	(-0.48)	0.450	-0.040	0.440	0.000	0.720
Advanced	0.016	-0.010	0.026	0.012	0.007	0.000	0.015
	(0.56)	(-0.19)	0.350	0.270	0.220	0.000	0.500
Internet	**-0.023***	-0.070	**-0.068***	-0.031	**-0.021****	0.000	**-0.0324*****
	(-2.30)	(-1.58)	(-2.28)	-1.820	(-2.86)	0.000	(-4.23)
Outcome 2: Employed (Other)							
Own a Mobile	0.110	**-0.186***	-0.047	0.109	0.099	0.144	0.086
	(1.95)	(-2.39)	-0.530	1.420	1.180	0.940	1.520
Intermediate	**0.103***	-0.023	**0.270*****	0.067	**0.135***	0.185	**0.084***
	(2.55)	(-0.48)	(3.38)	1.200	(2.36)	0.010	(2.05)
Advanced	**0.118***	-0.010	**0.335*****	0.103	**0.138***	0.076	**0.117***
	(2.41)	(-0.19)	(3.37)	1.470	(2.02)	0.540	(2.31)
Internet	0.048	-0.070	0.043	0.041	0.058	-0.023	0.0711
	(1.13)	(-1.58)	0.510	0.710	0.940	-0.230	(1.51)

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

Employed other contains urban self-employed, and urban and rural individuals employed by other people/entities

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