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THE IMPACT OF DIGITAL TECHNOLOGY ON HOUSEHOLD ECONOMIC STATUS IN DEVELOPING COUNTRIES

A CASE STUDY OF NIGERIA

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ABSTRACT

Over the past few decades, mobile and wireless technologies have been evolving rapidly which has influenced household income, wealth, and consumption levels, especially in developing countries. Specifically, this paper estimates the impact of digital technology on household economic status in Nigeria, the largest economy and mobile market in Africa. The analysis exploits a unique data set in 2018 from a nationally representative longitudinal household survey on living standards, with information on their usage and access to specific digital technologies. In performing this analysis, multiple linear regression analysis and state-fixed effects estimates were employed. The Variance Inflation Factor was also used to test for multicollinearity and a heterogeneity analysis was conducted to examine the interaction effects among the variables. The results show that an increase in internet usage and mobile phone ownership in households can positively influence and increase household wealth. The study recommends that digital literacy should be promoted to maximize the benefits of mobile phone ownership and internet infrastructures should be expanded in rural areas to bridge the urban-rural gap. In addition, governments should collaborate to encourage mobile banking to increase financial inclusion.

Keywords: Digital Technology, Mobile Phone Ownership, Internet Usage, Household Wealth

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1. INTRODUCTION

Over the last few decades, digital technology has completely changed how individuals live their lives. Technology has had a big impact on many elements of economies, including household economic status, from smartphone use to internet access. Digital technology use has rapidly increased in developing nations, creating new potential for economic growth and development. With a case study of Nigeria, this paper seeks to examine how digital technology affects household economic status in developing countries.

Many studies have investigated the impact of digital technology (Agbatogun, 2013; Brown and Davis, 2004; Chiemeke and Imafidor, 2020) on household wealth (Bahia et al., 2020; Jie et al., 2020; Hernan et al., 2022), and some of these studies have connected mobile and internet technologies (Jenny and Isaac, 2010; Hjort and Jonas, 2019; Maude and Antoine, 2020) to household wealth and incomes. Some evidence such as Eynon and Malmberg (2021), indicates that like other technological innovations, the Internet tends to benefit people who are more educated than those who are less educated, which may help to explain why, despite significant advancements in Internet connectivity, poverty reduction in the least developed regions has been slow. However, more recent research (Zhou et al., 2020; Kemi, 2021) has demonstrated that the Internet has helped African businesses raise their productivity, create jobs, and engage in greater economic activities. However, little is known about how the Internet and mobile phone ownership affect wealth for households, especially in developing countries.

This paper builds on previous studies to make contributions to the literature and provides new evidence on how household economic status is impacted by digital technology – Internet usage and mobile phone ownership in Nigeria, Africa's largest economy and mobile broadband market (Bahia et al., 2020). It aims to answer the research question of if these digital technologies have the potential to positively affect household economic status. It uses a rich and the latest dataset from the Demographic Health Survey (DHS) database for Nigeria, 2018, a longitudinal household survey on living conditions that are nationally representative with full national coverage of the 36 states.

To bridge the gap in the literature, this study will observe the outcome of household wealth in terms of the use of digital technology adoption and other potential factors that could impact it. It contributes to the existing literature by first, providing knowledge of an overview of digital technology in developing countries, and the impact and challenges of digital technology on

household economic status in Nigeria. Secondly, this paper adopts a multiple linear regression model and state-fixed effects technique to control unobserved heterogeneity across the states and a heterogeneity analysis to estimate the interaction effects among the variables.

The study finds that an increase in the use of the Internet and mobile phone ownership has a significant positive impact on household wealth. Households who had access to the internet and owned a mobile phone experienced an increase in household wealth by 0.56 and 0.43 percentage points respectively. It also showed that mobile phone ownership is more beneficial to those who are well-educated and live in urban areas. Furthermore, the study reveals that internet access is not beneficial to households in urban areas and more beneficial to those with no education which is contrary to the study by Eynon and Malmberg (2021).

This paper is influenced by the high rate of poverty in developing countries and examining how digital technologies can help alleviate poverty by increasing household economic status will give a pointer to which measure policymakers in these countries can pay attention to. Consequently, the findings of this study are crucial given the increasing global awareness of the role of digital technology in wealth creation as well as the United Nations (2021) and World Bank's (2018) drive towards technological development and advancement globally.

The rest of this paper is organized as follows. Section 2 reviews the theoretical and empirical literature of the impact of digital technology on household economic status. Section 3 explains the dataset and goes further to describe the variables used in the econometric methodology. Section 4 presents the main results from the multiple linear regressions, fixed effects estimates, and heterogeneity analysis, also testing for multicollinearity and robustness of the model. Finally, this paper concludes by offering recommendations for policymaking and practice in section 5.

2. LITERATURE REVIEW

2.1. Overview of Digital Technology in Developing Countries

There is a broad body of theoretical literature to support that a well-balanced, effective, and accessible digital technology in developing countries is very necessary to increase household economic status. The progress made in internet technology has brought about a significant change in human society, resulting in the world becoming a global village during the current information age (Garba et al., 2013).

Brown and Davis (2004) define digital technologies as tools that create and modify digital artifacts, such as digital audio and video, communication technologies, and media like the Internet and mobile phones. Moreover, digital media is perceived as a shift from the traditional, passive nature of media, towards more interactive platforms like social networks, instant messaging, interactive games, mobile phones, and virtual 3D environments that foster identity formation, social connections, and learning (Craton 2011; Gross et al. 2002; Jackson 2008).

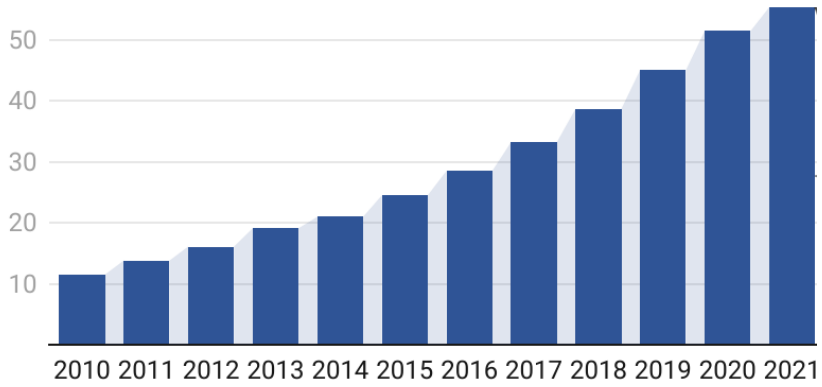
The growth of digital technology is experiencing exponential development worldwide (Agbatogun, 2013) and Africa has experienced significant growth in the digital technology sector with a rapid increase in the use of mobile phones. Mobile financial applications, also known as "m-money" or "m-banking," have emerged in several developing countries since 2005 (Jenny and Isaac, 2010). Typically, these systems consist of a range of applications that enable various financial transactions through mobile phones, such as transmitting airtime, paying bills, and transferring money between individuals (Jenny and Isaac, 2010).

In addition, telecommunication operators are increasingly focusing on developing economies, particularly in Sub-Saharan Africa, as they offer promising returns on investment with their vibrant and rapidly growing markets (Maude and Antoine, 2020). The mobile telecommunications market is thriving, and the younger generation is becoming increasingly connected as governments are prioritizing the digitization of society in response to these developments (Maude and Antoine, 2020). In developing countries, mobile technologies are being rapidly adopted, and the expansion of mobile broadband is expected to have a significant impact on their development (Maude and Antoine, 2020).

The use of the Internet is also on the rise with around one-quarter of the population in Kenya, Nigeria as seen in Figure 1 and Uganda using it. Due to the low subscription rate for fixed broadband, people rely on wireless technologies, and mobile broadband is becoming more prevalent (Maude and Antoine, 2020). Although the positive effects of internet availability are expected to be beneficial across all income levels, the specific impacts may vary depending on the income classes of different countries. In developing economies, it is crucial to have basic public infrastructure such as electricity distribution and education systems in place before the positive effects of internet availability can make a significant impact on the economy (Macdougald, 2011). According to Macdougald (2011), low-income countries may lack stable political and societal institutions necessary for their populations to benefit significantly from

internet access. In contrast, high and middle-income countries have achieved greater economic stability and can therefore attract investment in communication infrastructure to improve educational systems and produce a more literate population.

Figure 1: The Percentage of the Population Using the Internet in Nigeria from 2010-2021



Source: World Bank Database

There have also been possible mechanisms linking information and communication technologies (ICTs) to poverty reduction in rural areas of developing countries. One such study is Beuermann et al. (2012), which leverages variations in the timing of mobile phone service deployment to assess poverty impacts in rural villages in Peru. The research demonstrates that the availability of mobile services is associated with an increase in household consumption by approximately 11% and a reduction in household poverty by about 8%.

2.2. The Impact of Digital Technology on Household Economic Status in Nigeria

Digital technology has had a significant impact on household economic status in Nigeria, particularly in the areas of employment, entrepreneurship, and financial inclusion. Technological advancements are often proposed as viable solutions to enhance the economic well-being and living conditions of the population living in poverty (Banerjee and Duflo, 2007). Madon (2000) also acknowledges the significant societal impacts of the Internet in developing nations.

As a result of the varied aspects of digital technology, it is a challenging task to determine its impact completely and accurately on household economic status in a country. Consequently, researchers often employ the term "Information Communication Technology (ICT)" and related phrases such as internet, mobile subscription, and mobile phones interchangeably with digital technology (Chiemeke and Imafidor, 2020). This results in most studies only capturing the

effects of one or a few components of digital technology, rather than providing a comprehensive evaluation of its overall impact (Chiemeke and Imafidor, 2020).

However, in general, and drawing from previous studies, using mobile phones for financial transactions increases the likelihood of borrowing from financial institutions which can help households to improve their financial well-being, manage financial risks, absorb financial shocks, and strengthen their businesses (Kemi, 2021). Digital technology has also played a significant role in promoting financial inclusion in Nigeria. According to the Central Bank of Nigeria Annual Report (2018), the number of Nigerians with bank accounts has increased from 62% in 2014 to 69% in 2017, largely due to the growth of mobile money and other digital financial services. This increase in financial inclusion has allowed households to access credit and other financial services, which can help to improve their economic status.

Nigeria is one of the African countries that produce internet-enabled devices, including affordable mobile phones (McKinsey Global Institute 2013) and according to Lixi et al. (2019), the enhancement of digital connectivity, digital competencies, digital financial services, and other critical aspects of digital advancement can unlock fresh economic prospects and revolutionize the lives of people in Nigeria. Greater utilization of the Internet within a country leads to favorable influence on its economic growth (Changkyu and Myung, 2009). In addition, “the introduction of mobile phones has helped reduce rural-urban migration by providing job opportunities for many unemployed youths” (Ebikabowei and Benake-Ebide, pp. 249, 2013). Digital technology has also created new opportunities for entrepreneurship in Nigeria. E-commerce platforms like Jumia and Konga have become popular among Nigerians, providing a platform for small businesses to sell their products online. Similarly, fintech companies like Flutterwave and Paystack have made it easier for Nigerians to start and run their businesses, providing payment solutions and financial services that were previously unavailable.

Furthermore, the International Trade Administration (2021) revealed that Nigeria has an 82% share of Africa's telecom subscribers and 29% of internet usage. The Nigerian government recognizes the ICT sector as an enabler for developing critical sectors, such as education, healthcare, agriculture, and manufacturing, to diversify the economy from oil and gas, and is encouraging partnerships between local and foreign ICT companies (International Trade Administration, 2021). International Trade Administration (2021) also suggests that the government has supported the creation of incubator hubs, youth innovation programs, and

science technology parks, including the Abuja Technology Village. Additionally, the Federal Ministry of Communications and Digital Economy has the responsibility for the ICT sector and the National Digital Economy Policy and Strategy (2020-2030) to reposition the Nigerian economy toward opportunities that digital technologies provide (International Trade Administration, 2021).

However, challenges remain, which includes limited access to stable electricity and the Internet, lack of basic digital skills and education, high cost of technological devices and inadequate government policies.

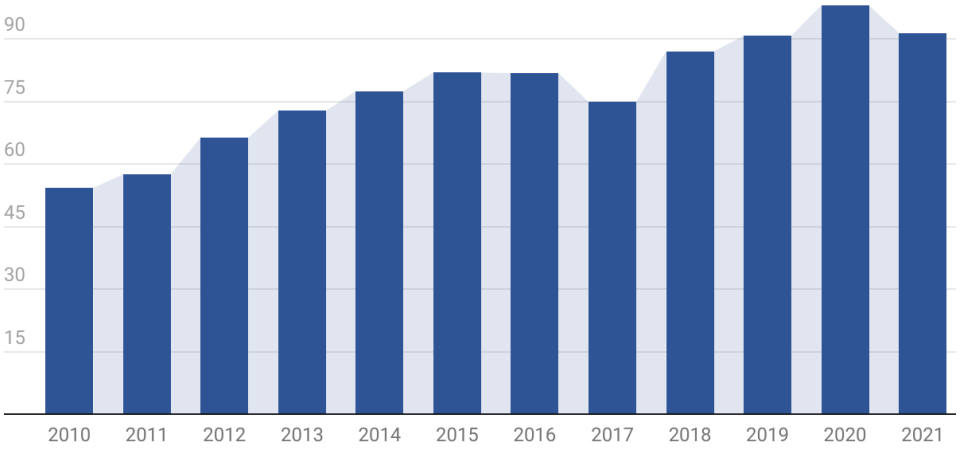
2.3. Challenges of Digital Technology in Nigeria

While digital technology has been known to have a positive impact on household economic status in Nigeria, there are also several challenges that need to be addressed. According to Kemi (2021), mobile money account ownership in Nigeria has increased from 2% in 2014 to about 6% in 2017, which is lower than the 21% in Sub-Saharan Africa. Similarly, the use of digital payment dropped from 37% in 2014 to 30% in 2017, which is also lower than the 34% of Sub-Saharan Africa (Kemi, 2021). In fact, only 7.7% of Nigerian adults use mobile phones to access financial accounts, compared to 20.8% in Sub-Saharan Africa (Kemi, 2021).

Despite possessing the biggest mobile market in Sub-Saharan Africa and being backed by the robust broadband infrastructure and enhanced global connectivity, Nigeria lacks sufficient fixed broadband infrastructure and connectivity in rural regions, which has resulted in a substantial portion of the most underprivileged population lacking access to the internet (Lixi et al., 2019) which makes it difficult for households to take advantage of the opportunities provided by digital technology.

Secondly, there is a widespread belief that mobile phones are accessible yet, a significant number of individuals in Nigeria are unable to afford them due to the high poverty rate in the country, with approximately 98 million people living in extreme poverty (Onyema, 2019). In Figure 2, it is evident that there has not been a consistent rise in mobile phone subscriptions and the cost of data required to access the internet remains a challenge. Access to the internet has been largely limited to urban areas which reveals that there is a significant digital divide. This can result in unequal opportunities for economic growth and development, with rural households being left behind.

Figure 2: The Mobile Cellular Subscriptions Per 100 People in Nigeria from 2010-2021



Source: World Bank Database

In addition, strong public and private digital platforms support the provision of digital services and a thriving eCommerce platform (Lixi et al., 2019). However, to access a variety of governmental and private services, millions of Nigerians need formal identification documents; as a result, there is a critical need to develop digital platforms. Lixi et al. (2019) further revealed that expanding access to digital financial services is crucial in Nigeria, where approximately 60 million adults lack access to formal financial accounts, hindering progress toward financial inclusion.

Furthermore, (Ebikabowei and Benake-Ebide, 2013) revealed challenges with mobile phone usage in Nigeria such as network failure, difficulty in finding recharge cards, high charges by network service providers, and unskilled individuals repairing phones in rural areas. Another major challenge is the inadequate power supply which can keep individuals out of business (Tiemo, 2006). Ochonogor (2006) identified theft, difficulty in understanding menu bars, short validity period, network congestion, and withholding of SMS as some of the main challenges.

Moreover, most developing nations lack the resources to build necessary infrastructure including electrical grids and telephone lines (Muhammed and Adnan, 2012). For underdeveloped countries to advance, technology must be available and easily accessible (Muhammed and Adnan, 2012). Wealthy individuals have access to technology in metropolitan regions, but it takes longer for technology to reach rural populations (Muhammed and Adnan, 2012).

The summary of empirical findings can be found in Table A in the appendix section.

3. DATA

3.1. Data Source and Variables

Data is gotten from the Demographic and Health Survey (2018) which was executed by the Nigerian Population Commission. The DHS is a well-established source of data for researchers studying developing countries, as it provides comprehensive and reliable data on a wide range of indicators. The survey is conducted every five years, with the most recent fieldwork being conducted in 2018. The DHS uses a stratified, multistage cluster sampling design to select households to participate in the survey. In Nigeria, the survey covers all 36 states with a sample size of 41,821 households. The survey comprised women who are between the ages of 15 and 49 and men who are between the ages of 15 and 59. The dataset has national coverage of 100%.

To examine the impact of digital technology on household economic status in Nigeria, this paper uses the following variables which were motivated by Changkyu and Myung (2009) who conducted a study on the effect of the internet on economic growth.

Wealth Index Combined

This variable will represent household economic status and the variable of interest otherwise known as the dependent variable in this study. The DHS (2018) measures the wealth index as the household's cumulative living standard, and it is determined using information gathered from households' ownership of assets. It takes a value of 1 if the individual is rich and 0 if poor.

Internet Usage

Internet usage is used as one of the proxies for digital technology and it includes the percentage of women and men who have used the internet in the past 12 months. Internet usage can impact household economic status by providing access to information, online job opportunities, e-commerce, and online education. It takes a value of 1 if the individual uses the Internet and 0 if the individual doesn't use the Internet.

Mobile Phone Ownership

Mobile phone ownership is also used as a proxy for digital technology, and it accounts for the percentage of women and men in households that own a mobile phone. Mobile phone ownership can provide the household with access to information, improved communication, enabled access

to financial services, and increased productivity. It takes a value of 1 if the individual owns a mobile phone and 0 if the individual does not own a mobile phone.

Employment

This control variable represents men and women currently employed in households. It is expected that being employed can impact household economic status positively by providing a steady income source. It takes a value of 1 if the individual is employed and 0 if the individual is unemployed.

High and No Education

This control variable represents the percent distribution of men and women in the household that are educated up to higher school level, and without education. Education can impact household economic status positively by increasing earning potential and job opportunities which can lead to improved financial literacy and long-term financial stability. High Education takes a value of 1 if the individual is educated up to the higher education level, and 0 if the individual has no education.

Electricity

This control variable represents households that have access to electricity. Access to electricity can impact household economic status positively by providing opportunities for income-generating activities, such as small businesses and home-based enterprises. It takes a value of 1 if individuals have access to electricity and 0 if they don't.

Place of Residence

This control variable indicates individuals living in urban or rural areas. Place of residence can affect household economic status in terms of access to job opportunities, education, healthcare, and basic infrastructure. Urban households may have better access to these resources while rural households may face more challenges in accessing these resources, resulting in lower economic status. It takes a value of 1 if the individual lives in the urban area and 0 if the individual lives in the rural area.

House Ownership

This control variable represents individuals who own a house. It provides economic benefits such as the ability to accumulate wealth through home equity, access to credit, and lower housing

costs over the long term. It takes a value of 1 if the individual owns a house and 0 if the individual does not have a house.

Number of Household Members

This control variable can also affect household economic status in several ways. Larger households may have higher expenses related to housing, food, and other necessities, which can affect their ability to accumulate wealth. However, larger households may also have more sources of income, and pooling resources can lead to greater financial stability.

Age and Gender

Age and gender-related inequalities may result from elements such as salary discrepancies among individuals and age-related income disparities and this can affect the economic status of households.

3.2. Estimation Strategy

According to Collischon and Eberl (2020, pp. 292), "the main benefit of fixed effects estimations is that the potential sources of biases in the estimations are limited in comparison to classical OLS models". It is "almost always much more convincing than the random effect for policy analysis using aggregated data" (Wooldridge, 2013, p.496) and it is relatively simple to use (Clark and Linzer, 2014). In this study, therefore, a fixed effects model will be employed to examine the impact of digital technology on household economic status, while controlling for other factors that could affect it. The model will also use state-fixed effects to account for unobserved heterogeneity across states in Nigeria.

The model can be specified as follows:

$$Wealth_{ijt} = \beta 0 + \beta 1Phone_{ijt} + \beta 2Internet_{ijt} + \beta 3Age_{ijt} + \beta 4Gendert_{ijt} + \beta 5Employment_{ijt} + \beta 6Electricity_{ijt} + \beta 7HighEducation_{ijt} + \beta 8NoEducation_{ijt} + \beta 9Residence_{ijt} + \beta 10OwnHouse_{ijt} + \beta 11HHmembers_{ijt} + \eta_i + \varepsilon_{ijt}$$

Where, $Wealth_{it}$ is measured as individual j wealth in the household in state i at time t. $MobilePhone_{it}$ is measured as a binary variable indicating whether individual j in the household owns a mobile phone or not in state i at time t. $InternetUsage_{it}$ is measured as a binary variable indicating whether individual j in the household uses the internet or not in state i at time t. Age_{ijt} is measured as the age of individual j in the household in state i at time t. $Gendert_{ijt}$ is measured

as the gender of individual j in the household in state i at time t. $Employment_{it}$ is measured as a binary variable indicating if individual j in the household is employed or not in state i at time t. $Electricity_{it}$ is measured as a binary variable indicating if individual j in the household has access to electricity or not in state i at time t. High and No $Education_{it}$ is measured as the level of education attained by individual j in the household in state i at time t. $Residence_{it}$ is measured as a binary variable indicating whether individual j in the household is living in a rural or urban area in state i at time t. $OwnHouse_{it}$ is measured as a binary variable indicating if individual j in the household owns a house or not in state i at time t. $HHmembers_{it}$ is measured as individual j number of household members in state i at time t.

η_i is the state-fixed effect, which captures the unobserved heterogeneity across states that does not vary over time. ε_{it} is the error term.

This paper also conducts the Variance Inflation Factor (VIF) to check for multicollinearity and a heterogeneity analysis to conduct interaction effects among the variables.

4. PRESENTATION AND ANALYSIS OF DATA

4.1. Descriptive Statistics

In Table 1, this study starts by presenting the descriptive statistics which show the different averages for all the variables as well as their standard deviation, minimum and maximum values in the sample. The mean value for wealth is 0.403, with a standard deviation of 0.491. This indicates that the distribution of wealth in the population is highly skewed and below average of the population is wealthy. The mean value for mobile phone ownership is 0.541, indicating that more than half of the population owns a phone. For internet access, the mean value is 0.151, indicating that internet access is relatively low in the population.

The mean age of the population is 29.16 years with a standard deviation of 9.706, indicating that the population is relatively young. The mean value for gender is 0.828, indicating that there are more male than female heads in the household. The mean value for employment status is 0.647, indicating that most of the individuals in the household are employed. The mean value for electricity access is 0.54, indicating that slightly over half of the household has access to electricity.

Table 1: Descriptive Statistics

Variable	Observations	Mean	Standard Deviation	Min	Max
Wealth	41821	.403	.491	0	1
Phone	41821	.541	.498	0	1
Internet	41821	.151	.358	0	1
Age	41821	29.16	9.706	15	49
Gender	41821	.828	.378	0	1
Employment	41821	.647	.478	0	1
Electricity	41821	.54	.498	0	1
Higheducation	41821	.503	.5	0	1
Noeducation	41821	.344	.475	0	1
Residence	41821	.406	.491	0	1
Ownhouse	41821	.123	.328	0	1
HHmembers	41821	6.568	3.893	1	37

The mean values for higher education and no education are 0.503 and 0.344 respectively, indicating that more than half of the households have received higher education, while about one-third of the households have no education. The mean value for residence type is 0.406, indicating that slightly more than 40% of the population resides in urban areas. The mean value for house ownership is 0.123, indicating that house ownership is relatively low in the population.

Finally, the mean number of household members is 6.568 with a standard deviation of 3.893, indicating that the households consist of large households.

4.2. Pairwise Correlation Matrix

Table 2 shows the correlation matrix that explains the relationships among the 12 variables. The matrix displays the correlation coefficients between each pair of variables, as well as their p-values. It also measures the strength and direction of the relationship between two variables. A positive correlation coefficient indicates that the two variables are positively related, meaning that when one variable increases, the other variable tends to increase as well. A negative correlation coefficient indicates that the two variables are negatively related and a coefficient of 0 indicates no correlation between the two variables.

Table 2: Pairwise Correlation Matrix

Variables	Wealth	Phone	Internet	Age	Gender	Employment	Electricity	Higheducation	Noeducation	Residnce	Ownhouse	HHmembers
Wealth	1.000											
	(0.000)											
Phone	0.432*	1.000										
	(0.000)											
Internet	0.406*	0.358*	1.000									
	(0.000)	(0.000)										
Age	0.032*	0.143*	-0.063*	1.000								
	(0.000)	(0.000)	(0.000)									
Gender	-0.077*	-0.153*	-0.127*	-0.034*	1.000							
	(0.000)	(0.000)	(0.000)	(0.000)								
Employment	0.041*	0.180*	0.018*	0.345*	-0.066*	1.000						
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)							
Electricity	0.588*	0.346*	0.284*	0.016*	-0.080*	0.011*	1.000					
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.028)						
Higheducation	0.484*	0.402*	0.404*	-0.200*	-0.174*	0.014*	0.357*	1.000				
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)					
Noeducation	-0.445*	-0.423*	-0.301*	0.107*	0.204*	-0.098*	-0.347*	-0.729*	1.000			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
Residence	0.473*	0.320*	0.282*	0.023*	-0.115*	0.026*	0.423*	0.330*	-0.322*	1.000		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
Ownhouse	0.013*	0.095*	-0.009	0.238*	-0.049*	0.157*	-0.017*	0.005	-0.089*	0.031*	1.000	
	(0.007)	(0.000)	(0.063)	(0.000)	(0.000)	(0.000)	(0.001)	(0.355)	(0.000)	(0.000)		
HHmembers	-0.098*	-0.182*	-0.144*	0.036*	0.270*	-0.068*	-0.058*	-0.189*	0.213*	-0.089*	-0.069*	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

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

From the correlation matrix, we can see that wealth is positively correlated with phone ownership (r=0.432) and internet usage (r=0.406), while negatively correlated with having no education (r=-0.445). Phone ownership is also positively correlated with internet access (r=0.358), higher education (r=0.402), and residency (r=0.320). Age has a positive correlation with phone ownership (r=0.143) and a negative correlation with being female (r=-0.077). Gender is negatively correlated with most of the variables, such as electricity access (r=-0.080) and having no education (r=0.204). Employment status is positively correlated with electricity access (r=0.011) and higher education (r=0.014). Having higher education is also positively correlated with residency (r=0.330) and having no education is negatively correlated with residency (r=-0.322). Finally, the number of household members is negatively correlated with mobile phone ownership (r=-0.182) and positively correlated with residency (r=0.213).

4.3. Main Results and Discussions

This section starts by presenting the main results of the analysis. In Table 3, the multiple regression results of the impact of mobile phone ownership and internet use on wealth without the control variables and state-fixed effects is shown in column 1, 2 and 3.[1] It also shows the impact of these technologies on wealth with state-fixed effects which can be seen in column 4, 5 and 6[2]. Lastly, it analyses if there will be changes in the regression results when analyzing the impact of both digital technologies on wealth when the control variables are included, with and without state-fixed effects as seen in columns 7[3] and 8[4].

In column 1, the impact of the effect of mobile phone ownership on wealth is estimated and it shows that there is a significant and positive impact of mobile phone ownership on wealth. It simply suggests that for every one-unit increase in mobile phone ownership, we can expect wealth to increase by 0.426 percentage points. The R-squared value of 0.187 indicates that 19% of the variation in wealth can be explained by the variation in mobile phone ownership. In column 2, the impact of internet usage on wealth is estimated and we can see that there is a positive and significant relationship between internet usage and wealth. In comparison to column 1, the result suggests that internet usage has more impact on wealth than mobile phone ownership. It shows that a one-unit increase in households' internet usage will lead to a 0.556 percent increase in their wealth. This result could be attributed to several factors because internet usage provides a wider range of opportunities for income generation, job searching, and entrepreneurship than mobile phone ownership. With the Internet, households can engage in e-commerce, and online businesses, and perform financial transactions which can increase their income and overall wealth. In contrast, mobile phone ownership may not provide such opportunities to the same extent, as it is primarily used for communication and basic internet browsing.

[1] Regression results of the impact of mobile phone ownership and internet use on wealth without the control variables and state-fixed effects.
[2] Regression results of the impact of mobile phone ownership and internet use on wealth without the control variables but with state-fixed effects.
[3] Regression results of the impact of mobile phone ownership and internet use on wealth with the control variables but without state-fixed effects.
[4] Regression results of the impact of mobile phone ownership and internet use on wealth with the control variables and state-fixed effects.

Table 3: Impact of Digital Technology on Household Wealth

	(1) Wealth	(2) Wealth	(3) Wealth	(4) Wealth	(5) Wealth	(6) Wealth	(7) Wealth	(8) Wealth
Phone	0.426***		0.324***	0.290***		0.233***	0.106***	0.0926***
	(0.00434)		(0.00444)	(0.00434)		(0.00440)	(0.00413)	(0.00403)
Internet		0.556***	0.394***		0.373***	0.286***	0.189***	0.156***
		(0.00612)	(0.00617)		(0.00600)	(0.00603)	(0.00538)	(0.00534)
Age							0.00342***	0.00201***
							(0.000199)	(0.000195)
Gender							0.0638***	0.0709***
							(0.00472)	(0.00464)
Employment							-0.0177***	-0.0241***
							(0.00384)	(0.00384)
Electricity							0.348***	0.321***
							(0.00396)	(0.00401)
Higheducation							0.165***	0.135***
							(0.00531)	(0.00520)
Noeducation							-0.0804***	-0.0389***
							(0.00543)	(0.00562)
Residence							0.174***	0.193***
							(0.00395)	(0.00421)
Ownhouse							-0.0203***	-0.0106
							(0.00536)	(0.00543)
HHmembers							0.00107*	0.00471***
							(0.000461)	(0.000464)
_cons	0.173***	0.319***	0.168***	0.0865***	0.162***	0.0986***	-0.143***	-0.174***
	(0.00319)	(0.00238)	(0.00305)	(0.0125)	(0.0125)	(0.0121)	(0.00867)	(0.0135)
N	41821	41821	41821	41821	41821	41821	41821	41821
R^2	0.187	0.165	0.259	0.319	0.311	0.354	0.506	0.539

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The resulting outcome of the data analysis may also reflect the fact that internet access is still a luxury for many households in developing countries like Nigeria. As such, households that have access to the Internet might be more affluent than those who only own a mobile phone. The data also reflects the broader trend of the increasing importance of digital technologies in economic

development and wealth creation. In column 3, the impact of using both digital technologies on household wealth is analyzed and we can see that using both technologies have a smaller impact on household wealth. On average, a one-unit increase in the use of both technologies will lead to an increase in household wealth by 0.359 percentage points.

Columns 4, 5, and 6 show the impact of mobile phone ownership and internet usage on household wealth across the states in Nigeria, with state-fixed effects. The state-fixed effects controls for any differences in household wealth across the states. In columns 4 and 5, the coefficients indicate the change in household wealth associated with a one-unit change in mobile phone ownership and internet usage respectively. The coefficient for phone ownership is 0.29 and 0.373 for internet usage indicating that a one-unit increase in phone ownership and internet usage is associated with a 0.29 and 0.373 percent point increase in household wealth respectively. These coefficients are statistically significant and suggest that mobile phone ownership and internet usage have a positive impact on household wealth.

In column 4, the coefficients for the state-fixed effects represent the difference in household wealth between each state with mobile phone ownership.[5] For example, the coefficient for Zamfara is -0.016, which suggests that households in Zamfara have 0.016 wealth on average. The coefficients for Jigawa, Yobe, Borno, Kaduna, Niger, FCT Abuja, Nasarawa, Kwara, Oyo, Osun, Ekiti, Ondo, Edo, Anambra, Enugu, Cross River, Akwa Ibom, Abia, Imo, Rivers, Bayelsa, Delta, Lagos, and Ogun are all positive and statistically significant, indicating that households in these states have higher wealth. The coefficients for Katsina, Adamawa, Gombe, Plateau, and Ebonyi are not statistically significant, suggesting that household wealth is lower in these states. Variations in the uneven distribution of wealth across the states may be because of inequality in access to resources and opportunities.

In column 5, the results show that several states have a significant impact on household wealth with respect to internet usage.[6] For instance, Zamfara has a negative coefficient of -0.034, indicating that internet usage has a negative impact on household wealth. Conversely, several states, such as Kaduna, Lagos, and Abia have positive coefficients, indicating that internet usage has a positive impact on household wealth in these states. Column 6 also shows results that are

[5] The whole state-fixed effects analysis is shown in Table B in the appendix section.
[6] The whole state-fixed effects analysis is shown in Table C in the appendix section.

identical to the previous results.

Column 7 shows the results of a regression analysis that examines the impact of mobile phone ownership and internet usage on household wealth while controlling for several factors - age, gender, employment, electricity, education, residency, house ownership, and household size. The results indicate that mobile phone ownership and internet usage still have a positive and statistically significant impact on household wealth. Specifically, for every one-unit increase in mobile phone ownership, household wealth increases by 0.106 units while controlling for these factors, and for every one-unit increase in internet usage, household wealth increases by 0.189 units. These effects are both statistically significant at the 0.01 level, indicating that they are very unlikely to have occurred by chance.

The factors controlled for also show significant relationships with household wealth. Age, gender, high education level, residence, and household size are all positively related to household wealth, as opposed to no education level, employment, and owning a house which is negatively related to household wealth. The negative relationship between no education level and household wealth may be because it is often associated with lower income levels and less access to resources and opportunities that can lead to higher wealth accumulation. Electricity access has the largest coefficient estimate and is positively related to household wealth. In Column 8, we see similar results.

4.4. Test for Multicollinearity using the Variance Inflation Factor

To test multicollinearity, this paper conducts the Variance Inflation Factor (VIF). It evaluates the degree to which the correlation between the predictors raises the variance of an estimated regression coefficient (Michael et al., 2015). In general, a VIF value greater than 5 or 10 indicates that there is multicollinearity among the predictor variables (Kim, 2019), and the estimates of regression coefficients may be unreliable.

According to Noora (2020), the VIF is calculated as;

$$VIF = \frac{1}{1-R^2} = \frac{1}{Tolerance}$$

Where tolerance is just the VIF's inverse. A general rule of thumb is that a VIF value of approximately 1 or below is considered low, indicating that the variable has little or no correlation with the other variables in the model.

Table 4: Variance inflation factor

	VIF	1/VIF
Higheducation	2.479	.403
Noeducation	2.344	.427
Phone	1.49	.671
Electricity	1.373	.728
Residence	1.326	.754
Internet	1.307	.765
Age	1.307	.765
Employment	1.182	.846
HHmembers	1.132	.884
Gender	1.116	.896
Ownhouse	1.091	.917
Mean VIF	1.468	.

In Table 4, the VIF values for each predictor variable are shown along with their reciprocal values, which indicate the proportion of variance not shared with the other predictors. The mean VIF value for all predictors is 1.468, which is relatively low, indicating that there is low multicollinearity among the predictors in the model. Among the individual predictors, the variables of "high education" and "no education" have relatively higher VIF values, indicating they have moderate multicollinearity. In general, the VIF values for all the variables are below the threshold of 5 or 10, which means that the multicollinearity in the model is not a major issue, and the estimates of regression coefficients are likely to be reliable and accurate.

4.5. Heterogeneity Analysis

This study goes further to perform some heterogeneity analysis and presents results of the channel of impacts which helps to identify the factors that amplify or dampen the effects of mobile phone ownership and internet usage on household wealth.

In Table 5, the interaction effects between mobile phone ownership, high education, no education, residency, access to electricity, employment, and gender were analyzed. The results of the analysis suggest that the impact of phone ownership on wealth is affected by these factors.

Table 5: Mobile Phone Ownership and its Interaction with the Variables

	(1) Wealth	(2) Wealth	(3) Wealth	(4) Wealth	(5) Wealth	(6) Wealth
1.Phone	0.259***	0.336***	0.301***	0.160***	0.388***	0.345***
	(0.00600)	(0.00548)	(0.00525)	(0.00566)	(0.00737)	(0.0115)
1.Higheducation	0.340***					
	(0.00656)					
1.Phone#1.Higheducation	0.0418***					
	(0.00881)					
1.Noeducation		-0.275***				
		(0.00608)				
1.Phone#1.Noeducation		-0.138***				
		(0.00973)				
1.Residence			0.360***			
			(0.00693)			
1.Phone#1.Residence			0.0199*			
			(0.00881)			
1.Electricity				0.394***		
				(0.00568)		
1.Phone#1.Electricity				0.185***		
				(0.00787)		
1.Employment					-0.0734***	
					(0.00641)	
1.Phone#1.Employment					0.0693***	
					(0.00919)	
1.Gender						0.0765***
						(0.0102)
1.Phone_#1.Gender						0.0921***
						(0.0124)
_cons	0.0763***	0.328***	0.0884***	0.0343***	0.214***	0.241***
	(0.00350)	(0.00456)	(0.00336)	(0.00337)	(0.00477)	(0.00964)
N	41821	41821	41821	41821	41821	41821
R^2	0.302	0.274	0.311	0.413	0.189	0.188

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

For example, we can see that the interaction effect of phone ownership and high education has a positive and significant impact on wealth with 0.042 percent points, while the interaction effect of phone ownership and no education has a negative impact on wealth with -0.138 percent points. This reveals that mobile phone ownership is more beneficial to those with higher education compared to those with no education. Similarly, the interaction effect of phone ownership, employment, and residence has a positive impact on wealth with 0.069 and 0.02 percent points respectively, indicating that phone ownership is also more beneficial to those who are employed and living in urban areas.

Table 6: Internet Usage and its Interaction with the Variables

	(1) Wealth	(2) Wealth	(3) Wealth	(4) Wealth	(5) Wealth	(6) Wealth
1.Internet	0.576***	0.408***	0.562***	0.436***	0.566***	0.454***
	(0.0382)	(0.00598)	(0.0103)	(0.0137)	(0.0105)	(0.0122)
1.Higheducation	0.379***					
	(0.00446)					
1.Internet#1.Higheducation	-0.238***					
	(0.0387)					
1.Noeducation		-0.367***				
		(0.00450)				
1.Internet#1.Noeducation		0.249***				
		(0.0728)				
1.Residence			0.419***			
			(0.00454)			
1.Internet#1.Residence			-0.229***			
			(0.0125)			
1.Electricity				0.513***		
				(0.00401)		
1.Internet#1.Electricity				-0.0955***		
				(0.0149)		
1.Employment					0.0366***	
					(0.00496)	
1.Internet#1.Employment					-0.0176	
					(0.0129)	
1.Gender						-0.0618***
						(0.00662)
1.Internet#1.Gender						0.130***
						(0.0141)
_cons	0.161***	0.468***	0.174***	0.0730***	0.296***	0.372***
	(0.00288)	(0.00287)	(0.00268)	(0.00278)	(0.00398)	(0.00609)
N	41821	41821	41821	41821	41821	41821
R^2	0.288	0.279	0.310	0.409	0.166	0.167

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results in Table 6, however, show a different result for the interaction effect between internet usage and high education, residence, access to electricity, employment, gender, and no education. The interaction effect of internet access and residency has a negative impact on wealth, indicating that internet use is less beneficial for those who live in urban areas with -0.23. On the other hand, the interaction effect of internet access and no education has a positive impact on wealth with 0.249, indicating that internet use is more beneficial to those with no education.

This result is contrary to the results from Eynon and Malmberg's (2021) study that suggested that the Internet tends to benefit people who are more educated than those who are less educated, which may help to explain why, despite significant advancements in Internet connectivity, poverty reduction in the least developed regions has been slow. However, the positive impact of the interaction effect of internet use and no education on wealth can be attributed to the fact that

internet access will provide the uneducated with access to information and educational resources that they might not have otherwise had access to, allowing them to learn new skills and acquire knowledge that can improve their livelihoods.

5. ROBUSTNESS CHECKS

Mobile phone ownership has been established as an important factor in household wealth and this was reflected in the main results of this study. However, in recent years in Nigeria, the use of mobile phones for financial transactions has become more prevalent, and it may be a better measure of digital technology.

Earlier in this paper, in Table 3, this study revealed a more significant impact of internet usage on wealth compared to mobile phone ownership. One of the factors that were attributed to this result was that individuals who own a mobile phone and use the internet to perform financial transactions with it can increase their income and overall wealth. Therefore, this study replaces the independent variable of "mobile phone ownership" with the "use of mobile phones for financial transactions" to test the robustness of the main results.

To do this, the household survey data from the DHS database is still used for analysis. In the original model, mobile phone ownership was included as a binary variable indicating if an individual in the household owns a mobile phone or not. This variable is replaced with a new binary variable indicating whether individuals in the household use their mobile phones for financial transactions or not.

The new econometric model is given as;

$$Wealth_{ijt} = \beta 0 + \beta 1 Fintransactions_{ijt} + \beta 2 InternetUsage_{ijt} + \beta 3 Ag_{ijt} + \beta 4 Gendert_{ijt} + \beta 5 Employment_{ijt} + \beta 6 Electricity_{ijt} + \beta 7 HighEducation_{ijt} + \beta 8 NoEducation_{ijt} + \beta 9 Residence_{ijt} + \beta 10 OwnHouse_{ijt} + \beta 11 HHmembers_{ijt} + \eta_i + \varepsilon_{ijt}$$

In Table 7, column 1[7], the regression result shows the independent impact of the use of mobile phones for financial transactions on wealth. We can see that a one-unit increase in this variable will lead to a 0.535 percent point increase in household wealth. In Table 3, it suggested that mobile phone ownership and internet use increased household wealth with 0.426 and 0.556 percent points. We can therefore infer that the difference in impact on household wealth among

[7] Regression results of the impact of the use of mobile phone for financial transactions on wealth without the control variables and state-fixed effects.

these 3 variables isn't wide.

Table 7: Impact of Financial Transactions and Internet Use on Household Wealth

	(1) Wealth	(2) Wealth	(3) Wealth	(4) Wealth	(5) Wealth	(6) Wealth
Fintransactions	0.535***	0.308***	0.114***	0.346***	0.205***	0.0763***
	(0.00648)	(0.00752)	(0.00618)	(0.00632)	(0.00711)	(0.00677)
Internet		0.392***	0.164***		0.277***	0.106***
		(0.00720)	(0.00599)		(0.00682)	(0.00682)
Age			0.00366***			0.00328***
			(0.000199)			(0.000306)
Gender			0.0606***			0.0793***
			(0.00473)			(0.00607)
Employment			-0.0110**			-0.0223***
			(0.00383)			(0.00599)
Electricity			0.359***			0.395***
			(0.00394)			(0.00602)
Higheducation			0.168***			0.130***
			(0.00533)			(0.00738)
Noeducation			-0.101***			-0.0641***
			(0.00539)			(0.00912)
Residence			0.180***			0.190***
			(0.00396)			(0.00577)
Ownhouse _			-0.0177***			-0.0121
			(0.00538)			(0.00725)
HHmembers			0.000613			0.00457***
			(0.000462)			(0.000729)
_cons	0.330***	0.302***	-0.106***	0.166***	0.163***	-0.171***
	(0.00239)	(0.00237)	(0.00874)	(0.0126)	(0.0124)	(0.0248)
N	41821	41821	41821	41821	41821	22636
R^2	0.140	0.197	0.502	0.297	0.324	0.464

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In column 2[8], the effect of the use of mobile phones for financial transactions and internet use on household wealth is analyzed. The use of mobile phones for financial transactions combined with internet usage will increase household wealth by 0.35 percent point. In comparison to Table 3, we see that the average of both internet usage and mobile phone ownership led to an increase in

[8] Regression results of the impact of the use of mobile phone for financial transactions and internet use on wealth without the control variables and state-fixed effects.

household wealth by 0.359 percent point. This is not very different from what we have in column 2 in Table 7. In column 3[9], another analysis is carried out to estimate the impact of both variables with the controls, and still, the outcome of the analysis shows similar results of a positive and significant impact on household wealth. In columns 4, 5, and 6[10], the same analysis is run but with state-fixed effects. Throughout, the use of mobile phones for financial transactions remains positive and significant therefore still having a positive impact on household wealth.

6. CONCLUSION AND POLICY RECOMMENDATIONS

The findings of this paper provide proof that increasing internet use and mobile phone ownership in households has a favorable effect on their wealth. It demonstrates how crucial these digital technologies are to enhancing economic well-being and implies that measures encouraging their adoption can support equitable economic growth. Firstly, the study showed that owning a mobile phone significantly increases household wealth. Comparatively, to those with no education, people with greater levels of education typically profit more from owning a mobile phone. This emphasizes how crucial digital knowledge and expertise are for maximizing the advantages of mobile technology. Additionally, those with jobs and those who live in urban areas benefit more from having a mobile phone, highlighting the importance of connectivity and access to job prospects.

Secondly, the study also shows that Internet usage has conflicting effects on household wealth. While it is less helpful for people who live in urban areas, it is more helpful for people who have never had any form of education. This emphasizes how the Internet has the potential to close educational gaps and offer chances for socioeconomic growth, especially for those who encounter obstacles to traditional educational pathways. Furthermore, this study's robustness checks show that using a mobile phone for financial transactions is linked to greater household wealth. This shows that digital financial services and mobile banking could improve household economic outcomes and promote financial inclusion.

Based on the findings and discussions of this study, several policy recommendations have been made to harness the potential of digital technology in enhancing household economic status. Firstly, promoting the development of digital literacy is important for maximizing the advantages

[9] Regression results of the impact of the use of mobile phone for financial transactions and internet use on wealth with the control variables but without state-fixed effects.
[10] Regression results of the impact of the use of mobile phone for financial transactions and internet use on wealth with state-fixed effects.

of mobile phone ownership. Policymakers should concentrate on offering digital literacy training programs, particularly for people with less education. This way, they will be able to access internet resources and fully exploit mobile technology. Secondly, there should be an expansion of internet infrastructure in rural areas to bridge the urban-rural gap and take advantage of the favorable impacts that internet connection has on household economic status. This includes projects to promote digital inclusion through training, cost reduction, and improvements to broadband connectivity.

Furthermore, governments and financial institutions should collaborate to encourage the usage of mobile banking and digital financial services to increase financial inclusion. This entails enhancing the usability and security of mobile banking platforms, spreading awareness of their advantages, and making sure that regulatory frameworks are in place to safeguard consumers. Policymakers must also be cautious in addressing any possible disparities that may exist as mobile technology and internet connections become increasingly necessary for wealth creation in households. This involves assuring equal access to technology, removing obstacles like high data charges, and putting in place measures to close the digital divide between various socioeconomic groups. In conclusion, policymakers may promote inclusive economic growth and enhance the welfare of households by putting the recommended policies into practice. This will allow them to take advantage of the revolutionary power of digital technology.

For future research, a study on the impact of digital technology on household economic status could incorporate another estimation method like the Difference-in-Difference method and/or use a mixed-methods approach. In addition, making a comparison of how digital technology affects household economic status in both developed and developing countries could also be an opener to those strategies that make digital technologies in developed countries more efficient. This would provide a more comprehensive understanding of the nuances and underlying factors influencing the relationship between digital technology adoption and economic outcomes.

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8. APPENDIX

Table A: Summary of Empirical Findings

Authors	**Topic**	**Sample Size**	**Research Methodology**	**Major Findings**
Bahrini and Qaffas (2019)	Impact of Information and Communication Technology on Economic Growth: Evidence from Developing Countries.	MENA and SSA countries, 2007-2016	Panel Generalized Method of Moment (GMM) growth model	The result demonstrates that, aside from fixed telephone, mobile phone, Internet use, and broadband adoption are the primary forces behind economic growth in developing MENA and SSA countries.
Kpodar and Andrianaivo (2011)	ICT, Financial Inclusion, and Growth Evidence from African Countries	African countries, 1988-2007	System Generalized Method of Moment (GMM) estimator	Their findings support the notion that ICT, particularly the advancement of mobile phones, greatly contributes to economic growth in African nations. Mobile phone penetration has a favorable impact on growth because of increased financial inclusion.
Diether, Beuermann and Renos (2012)	Mobile Phones and Economic Development in Rural Peru	Village-level panel data with final sample comprises 45,401 rural household-year observations.	Fixed Effects	Result shows that the expansion of mobile phones has raised household real consumption by 11%, decreased the incidence of poverty by 8%, and decreased extreme poverty by 5.4 percentage points.
Bahia K.,	The Welfare	Mobile	Fixed Effects	According to the

Castells, P., Cruz G., Masaki T., Pedros X., Pfutze T., Rodriguez C. C. and Winkler H J. (2020).	Effects of Mobile Broadband Internet: Evidence from Nigeria	broadband coverage and three waves of the General Household Survey from 2010-2016 in Nigeria.		estimations, mobile broadband availability significantly and favorably impacted household consumption levels, which rose over time because rural households tend to consume more food and non-food items than urban households, mobile broadband availability also lowers the percentage of households who fall below the poverty line.
Jie L., Yu W. and Jing J. X. (2020).	The Impact of Digital Finance on Household Consumption: Evidence from China	Panel data from the China Household Finance Survey (CHFS) in 2013, 2015 and 2017	Fixed Effects and Heterogeneity Analysis	The results implied that household consumption may be enhanced through digital inclusive financing. A heterogeneity analysis also revealed that households in third- and fourth-tier cities, with lower incomes, fewer assets, and less financial literacy, had bigger enabling impacts of digital finance on spending than their counterparts.
Adeleye and Eboagu (2019)	Evaluation of ICT Development and economic growth in Africa	54 African countries from 2005 to 2015	Pooled Ordinary Least Squares, Random and Fixed Effects	Results show that ICT development has a statistically significant positive relationship with economic growth and the

			and System Generalized Method of Moment (GMM) model	output elasticities of internet usage, mobile subscribers and fixed telephone subscriber are significantly different. The "leapfrogging" hypothesis holds and mobile subscription was suggested to have the largest output elasticity across all specifications and has the biggest potential to allow Africa to skip traditional developmental stages.
Macdougald (2011)	Internet Use and Economic Development: Evidence and Policy Implications	Covers 202 countries from the period 1996-2007	Dynamic panel data and finite mixture model estimation techniques	The findings imply that countries gain from increased Internet use in diverse ways. Increased Internet usage has a large positive impact on per capita GDP and overall well-being in low-income nations.
Changkyu and Myung (2009)	The effect of the Internet on economic growth: Evidence from cross-country panel data	Data for 207 countries from 1991 to 2000	Pooled Ordinary Least Squares, Random and Fixed Effects, and Generalized Method of Moments	The spill-over effects of knowledge between nations is said to be aided by the Internet. As a result, it is assumed that a country's economic growth will benefit from a rise in Internet usage. They also found evidence that the

			(GMM) Estimation	Internet contributes positively and significantly to economic growth.
Hjort and Poulsen (2019)	The Arrival of Fast Internet and Employment in Africa	3 datasets, covering 12 African countries	Robust difference-in-differences estimates	From their result, they observe that when fast Internet becomes available, it leads to a strong and substantial relative increase in the employment rate in connected locations.
Hernan G., Raul K. and Ramiro V. (2022).	The Impact of Broadband on Poverty Reduction in Rural Ecuador	The analysis spans from 2011-2019	Semi-parametric alternative to the standard two-way fixed-effects (TWFE) estimator	The results show that the spread of broadband in rural regions is linked to measurable increases in employment and labor income. Additionally, given the decline in agricultural employment in the connected areas, their findings support the idea that ICTs contribute to the diversification of employment prospects.
Zhou X., Cui Y., and Zhang S. (2020).	Internet Use and Rural Residents' Income Growth		Multiple linear regression analysis and mediation effect analysis	They found that internet use directly influences rural residents' income growth, and entrepreneurial or non-agricultural employment indirectly influences rural residents' income growth. Internet use also directly influences income growth

				more than entrepreneurial and non-agricultural employment indirectly.
Kenny (2002)	Information and communication technologies for direct poverty alleviation: Costs and benefits.		Theoretical Review	The research showed that using traditional computers connected to the Internet as a tool for poverty alleviation should probably not involve programs for universal access, at least not until technological advancement has made Internet access less expensive and easier for the illiterate and minority-language speaker to use — and until education has become more pervasive.
Kenny, C. (2003).	The Internet and Economic Growth in Less-developed Countries: A Case of Managing Expectations?	Less Developed Countries (LDCs)	Empirical evidence on the limited impact of past "information revolutions"	The study finds that LDCs lack the structures necessary to take advantage of the e-economy, as well as the physical and human capital necessary to capitalize on the opportunities the Internet does bring. In addition, the effect of the internet on the global economy is small compared with the challenges of development.

Table B: Impact of Mobile Phone Ownership on Household Wealth with State-Fixed Effects

wealth_	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
phone_	.29	.004	66.78	0	.281	.299	***
		.	.	.	.	.	
states							
zamfara	-.016	.017	-0.96	.337	-.049	.017	
katsina	.015	.016	0.94	.345	-.016	.047	
jigawa	-.071	.016	-4.29	0	-.103	-.038	***
yobe	-.065	.017	-3.89	0	-.098	-.032	***
borno	.06	.017	3.58	0	.027	.093	***
adamawa	.004	.017	0.21	.83	-.031	.038	
gombe	-.011	.017	-0.68	.498	-.044	.021	
bauchi	-.039	.017	-2.34	.019	-.072	-.006	**
kano	.099	.015	6.41	0	.069	.129	***
kaduna	.153	.016	9.55	0	.122	.184	***
kebbi	-.028	.017	-1.69	.091	-.061	.004	*
niger	.125	.017	7.43	0	.092	.157	***
fct abuja	.355	.017	20.66	0	.321	.389	***
nasarawa	.185	.017	10.63	0	.151	.219	***
plateau	.019	.018	1.08	.282	-.015	.053	
taraba	-.073	.017	-4.35	0	-.106	-.04	***
benue	0	.017	0.01	.99	-.033	.033	
kogi	.11	.018	5.98	0	.074	.146	***
kwara	.213	.018	11.62	0	.177	.249	***
oyo	.407	.018	22.16	0	.371	.443	***
osun	.225	.019	11.89	0	.188	.262	***
ekiti	.29	.019	15.06	0	.252	.328	***
ondo	.204	.019	10.95	0	.168	.241	***
edo	.308	.02	15.26	0	.268	.347	***
anambra	.411	.017	24.08	0	.378	.444	***
enugu	.213	.018	11.96	0	.178	.247	***
ebonyi	.002	.017	0.13	.898	-.031	.035	
cross river	.205	.019	10.61	0	.167	.243	***
akwa ibom	.246	.018	13.56	0	.21	.281	***
abia	.521	.018	28.85	0	.485	.556	***
imo	.379	.018	21.08	0	.344	.414	***
rivers	.436	.017	25.04	0	.402	.47	***
bayelsa	.19	.019	9.88	0	.152	.227	***
delta	.418	.019	22.05	0	.38	.455	***
lagos	.634	.017	38.31	0	.602	.667	***
ogun	.462	.019	24.17	0	.424	.499	***
Constant	.087	.012	6.94	0	.062	.111	***

Mean dependent var	0.403	SD dependent var	0.491
R-squared	0.319	Number of obs	41821
F-test	530.081	Prob > F	0.000
Akaike crit. (AIC)	43095.434	Bayesian crit. (BIC)	43423.798

**** p<.01, ** p<.05, * p<.1*

Table C: Impact of Internet Usage on Household Wealth with State-Fixed Effects

wealth_	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
internet_	.373	.006	62.26	0	.362	.385	***
		.	.	.	.	.	
state							
zamfara	-.034	.017	-1.98	.048	-.067	0	**
katsina	.032	.016	1.96	.05	0	.064	**
jigawa	-.075	.017	-4.51	0	-.107	-.042	***
yobe	-.068	.017	-4.03	0	-.101	-.035	***
borno	.079	.017	4.64	0	.045	.112	***
adamawa	.04	.018	2.25	.025	.005	.074	**
gombe	-.012	.017	-0.71	.476	-.045	.021	
bauchi	-.05	.017	-2.98	.003	-.083	-.017	***
kano	.106	.015	6.87	0	.076	.137	***
kaduna	.164	.016	10.19	0	.132	.196	***
kebbi	-.038	.017	-2.26	.024	-.071	-.005	**
niger	.133	.017	7.91	0	.1	.167	***
fct abuja	.394	.017	22.83	0	.36	.428	***
nasarawa	.25	.017	14.34	0	.216	.284	***
plateau	.055	.018	3.11	.002	.02	.089	***
taraba	-.044	.017	-2.62	.009	-.077	-.011	***
benue	.041	.017	2.42	.016	.008	.074	**
kogi	.18	.018	9.78	0	.144	.216	***
kwara	.245	.018	13.28	0	.209	.281	***
oyo	.455	.018	24.72	0	.419	.491	***
osun	.319	.019	16.87	0	.282	.356	***
ekiti	.352	.019	18.23	0	.314	.39	***
ondo	.288	.019	15.40	0	.251	.324	***
edo	.35	.02	17.28	0	.31	.39	***
anambra	.453	.017	26.45	0	.419	.486	***
enugu	.266	.018	14.93	0	.231	.301	***
ebonyi	.052	.017	3.08	.002	.019	.085	***
cross river	.191	.02	9.78	0	.153	.229	***
akwa ibom	.266	.018	14.63	0	.231	.302	***
abia	.587	.018	32.49	0	.552	.623	***
imo	.439	.018	24.35	0	.403	.474	***
rivers	.452	.018	25.82	0	.418	.486	***
bayelsa	.265	.019	13.75	0	.227	.303	***
delta	.459	.019	24.13	0	.421	.496	***
lagos	.575	.017	34.09	0	.542	.608	***
ogun	.49	.019	25.53	0	.452	.527	***
Constant	.162	.012	12.99	0	.138	.187	***

Mean dependent var	0.403	SD dependent var	0.491
R-squared	0.311	Number of obs	41821
F-test	509.188	Prob > F	0.000
Akaike crit. (AIC)	43625.347	Bayesian crit. (BIC)	43953.711

**** p<.01, ** p<.05, * p<.1*