THE EFFECT OF TELEPHONE CONNECTION IN THE ECONOMIC GROWTH OF KENYA

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DECLARATION

This is my original work and has not been presented in any other university for award of degree.

Sign……..……. Date…….

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This paper is submitted with my approval as University supervisor

Sign……..……. Date…….

Prof. Anthony Wambugu

DEDICATION

To my parents for always believing in me.

ACKNOWLEDGEMENT

I thank God for His guidance and protection and for seeing me through my studies. Thank you to my lecturers who imparted valuable knowledge. I thank Prof. Anthony Wambugu for his support and guidance to me when writing this paper. My deepest appreciation goes to my loving parents and sisters, thank you for your encouragement and prayers.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	The Akaike information criterion
CAK	Communications Authority of Kenya
CBK	Central Bank of Kenya
ECM	Error correction model
ECT	Error correction term
GDP	Gross Domestic Product
GOK	Government of Kenya
GSM	Global System for Mobile Communication
HQIC	Hannan-Quinn Information Criterion
ICT	Information Communication Technology
OECD	Organization for Economic Cooperation and Development
SBIC	Bayesian Information Criterion

ABSTRACT

This paper investigated the relationship between telephone connection and GDP using time series data from Kenya for the period 1988 to 2018. Although telecommunication sector is identified as enabler of Kenya's vision 2030 and it has grown rapidly, empirical assessment of the effect of various components on GDP in Kenya is lacking. This paper sought to determine the effect of telephone connection on GDP of Kenya. An augmented Solow-Swan model was adopted. All the variables were integrated of order one and cointegration was detected. Therefore, ECM was used to analyze data. The speed of adjustment between the short run and the long run equilibrium was fairly rapid at 65.4%. The estimates show that telephone connection and GDP have a long run relationship. Thus policies that promote the telecommunications sector would increase GDP.

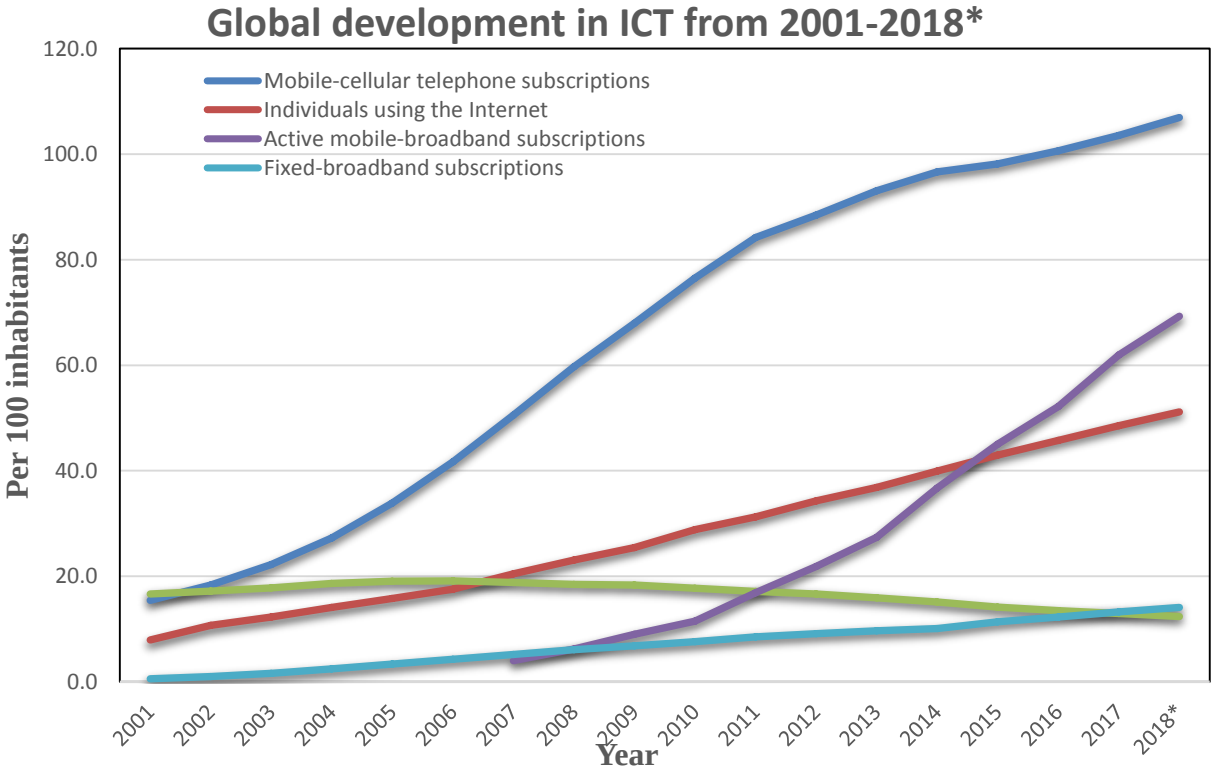
CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The telecommunication sector has achieved tremendous growth since the 1990s. In the year 1991, total fixed and mobile connections were at 49 per 100 inhabitants, 3.3 nations and just 0.3 in in developed, developing and least developed nations respectively (ITU 2002). By 2001, it was 121.1, 18.7 and, 1.1 respectively.

Access to telecommunication services and in particular mobile connections has expanded since 2001(Figure 1.1). The mobile phone has changed the world and opened a wide range of services and communication. This expansion can be attributed to new developments driven mobile phones such as internet banking, e-commerce, digital marketing and Mobile banking which enables consumers to transact anytime anywhere.



Source:Authors computation

Upon realizing the importance of telecommunication sector to economic growth, developing nations took the initiative. The initiatives include privatization of the telecommunication industry (World Bank, 1992). To derive greater economic benefits from communications technologies, there is a need to invest in telecommunications infrastructure as well as to adopt institutional reforms such as promoting private property, regulation, financial freedom, investment freedom.

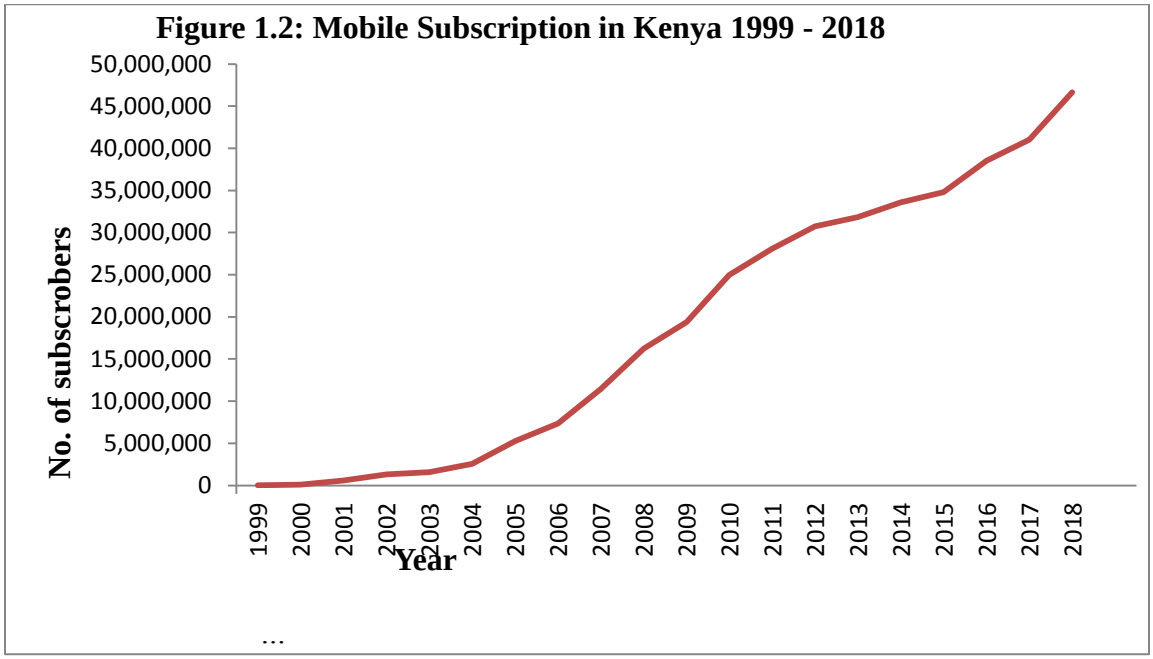
Growth in the telecommunication sector has led to large benefits (Norton 1992): These include, increased employment opportunities, Creation of a competitive market environment, and reduction in transaction costs which leads to higher aggregate output and growth. According to Roller and Waverman (2001), the spread of mobile and fixed connections contributed to one-third of GDP growth in 21 OCED nations between 1970 and 1990.

1.2 Kenya's Telecommunication sector

In the 1980s, a small number of people could access telephone services. There was only one telephone service provider in Kenya; Telecom Kenya. Moreover calling rates were high thereby locking out some consumers who could not afford. However, the telecommunications sector in Kenya is evolving as evidenced by the licensing of several global mobile operators (Safaricom, Airtel and, Telkom) and other companies providing internet services since the year 2000 under regulation by The Communications Authority of Kenya (CAK 2000).

The distribution of telephone services was also localized to major towns across the country implying that majority of Kenya's population could not access telephone services due to distance. The available telephone services were also inadequate and could not meet the demand; the available telephone booths were therefore characterized by long queues which led to inefficiencies. According to CAK report 2018, the telecommunication infrastructure is much developed in Kenya today. An example is the installation of the fiber-optic submarine cables which led to increase in access to internet services at affordable rates and has also drastically reduced calling rates. The telephone market in Kenya continues to grow as evidenced by the increased mobile subscriptions base which was at about 46 million in 2018.

Some of the notable changes over the period include increased connectivity, increased accessibility and also improvement in quality of service offered by various players in the telecommunication market.



Source: CAK (2018) data

Figure 1.2 shows that Mobile subscription in Kenya has grown from 15,000 subscribers in 1999 to over 46 million in 2018. Increased mobile connections have also spanned mobile money services. According to CBK (2018), mobile money transfers have increased from 1,577,680, 000 transactions worth of KSh 3,574,430,000,000 in year 2016/2017 to transactions increased to 1,619.970,000 transactions worth KSh 3,747,330,000,000 in year 2017/2018.

1.2 Research problem

The aim of Kenya Vision 2030 is to transform the country into an industrialized nation that provides quality life to its citizens by 2030. (GDP) growth rate is expected to be at 10% per annum from 2012 (GOK, 2007). However, this rate has not been achieved since 2012. The ICT sector (including telephone connection, internet) is identified as a key enabler to Kenya's economic growth (GoK, 2007). But there is limited empirical evidence of the link between the two variables.

Past studies on telephone connection and economic growth (e.g. Dutta, 2001; Waverman et al., 2005; Sridhar and Sridhar, 2007; Batuo, 2008; and Wainaina, 2012) focus on cross-county analysis. Given the heterogeneity of the telecommunication sectors across countries, a knowledge gap exists about the quantitative benefits of telecommunication in specific African countries. The question addressed is whether telephone connections are related to GDP in Kenya and if so, what is the nature of the relationship?

1.4 Research objectives

The aim is to examine the relationship between telephone connection and GDP of Kenya, while the specific objectives are:

a) To determine the effect of telephone connection on Kenya's GDP.
b) To identify the relationship between telephone connection and GDP.
c) To draw implications from the results.

1.3 Rationale

Telecommunication helps in the modernization and development of other sectors; including insurance, trade, agriculture, finance, and governance cannot be ignored. Thus the effect of telephone connection on GDP is more compared to the impact other sectors have on economic growth (Jha and kaleja; 2008).

Past studies on telecommunication and economic growth generally focusing on African nations were majorly carried out during periods which telecommunication technologies were not fully developed to affect economic growth. The study filled the void in the existing research as it covers the period when the mobile telephony market started to grow in Kenya up to the year 2017.

Various policies have been developed to guide the telecommunication sector. However, they are not informed by empirical evidence. It is assumed that telephone connection growth leads to economic growth. The findings from this study can help the government develop policies that will promote the telecommunication sector.

1.5 Outline of the study

Following this introduction, the second chapter reviews relevant literature relating to telecommunication and GDP. The methods and the source of data used are presented in chapter three. Chapter four presents the results while chapter five summarizes, concludes and draws implications of study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed the literature on the link between telecommunications and GDP. The first part is the theoretical literature review. The second part reviews empirical literature.

2.2Theoretical literature

Several theoretical views exist on telecommunications and GDP growth. In this paper the focus is on supply-leading hypothesis. Alleman et al. (2002) noted that investment in telecommunication lowers production cost, increase revenue and employment. Increased telephone connections increases information and knowledge which enhance production efficiency and improvement in service provision. In Kenya, access to mobile telephone and internet has improved information flow and telephone services.

The effect of telecommunication growth on GDP growth is different from the effect of other sectors to GDP growth (Hardy 1980). This is because it generates human capital and production externalities. According to the endogenous growth theory (Romer 2006) such externalities are essential to long-run economic growth. According to the neoclassical model, telecommunication sector investment improves skills of the labor force, generates investment multiplier effects, and technological advancement all of which contribute to GDP growth.

An efficient telecommunications sector ensures that there's maximization of profits for the service provider, utility maximization by the consumer and the government collecting its share of revenue as well as proving a safe, and competitive environment for conducting business (Li and Xu, 2002). However, according to Wallsten(2001), in developed countries, developed telecommunications sectors imply universal availability of telecommunication services. Adopting similar goals in developing countries pose potential problems. This is because; the goal of affordability may conflict with the goal of raising sufficient revenues to support investment in network expansion. Thus expansion in telecommunications sector could hurt GDP growth.

2.3 Empirical Literature

A number of cross-sectional studies focus on telecommunications and GDP. Sridhar and Sridhar (2007) focus on telephone penetration and GDP in 28 developing economies. The least square estimates show that mobile and fixed connections affect GDP positively.

Qiang (2009) also investigated telephone connections and GDP. The results show positive association between mobile penetration and GDP. The growth effect larger for mobile connections than fixed connections and internet access. A similar study (Roller and Waverman, 2001) found larger growth effect of telecommunication in OECD states than in developing nations.

The main disadvantage of cross-sectional studies is that countries in similar stages of growth were grouped, either as developed or developing countries. Thus the economic structure and technology used in production in these countries is assumed to be the same. However, this generalization is unrealistic. Another disadvantage of cross sectional analysis is that it ignore the changes in the relationship between variables from time to time.

Another strand of the literature uses time series data. This method of analysis is appropriate in determining whether there exist a long-run relationship. Beil *et al.* (2005), using data of fifty years carried out Granger causality tests in the USA. The results showed one-way causality between GDP and telecommunications development.

Kateja and Jha (2008) studied telecommunication development and GDP in India. The results of showed that telecommunication development enhances GDP. This is attributed to the rise in the value of services and the number of consumers of telecommunication services. From the results, growth of the telecommunication sector exerts a positive externality to other sectors growth.

A drawback of cross-country studies and time-series studies is that they cannot control for country specific effects. Researchers using Panel data studies are able to account for heterogeneity in countries and to have more degrees of freedom unlike in other studies. Chakraborty and Nandi (2011) analyzed the link between telecommunication and GDP in developing economies. The results showed bidirectional causality between fixed connections and GDP. However, in the short run, GDP growth caused fixed connections. Lam and Shiu (2010) estimated a dynamic panel model of 105 countries. The study found bidirectional causality

between teledensity and real GDP.. Waverman et al. (2005) investigated mobile phone penetration and GDP. The association between mobile phone connection and GDP was positive and statistically significant. The impact was higher in LDCs than in high income economies.

2.4 Overview of the Literature

The supply-leading hypothesis states that telecommunications contribute to economic growth. Previous empirical studies have investigated the relationship in a variety of methods and data. The results suggest such a link. Each of these studies has strengths and weakness. Still, there are relatively few studies of African economies on this subject. The current study fills this gap by investigating the relationship between phone connections and GDP of Kenya.

CHAPTER THREE

METHODS AND PROCEDURES

3.1Introduction

In the first section of this chapter the study theoretical framework is outlined. This is followed by the specification of the model and discussion of data issues and measurement of variables.

3.2 Theoretical framework

. The production function underlying the model (Solow, 1956) is:

$$Y(t) = f\big(K(t), A(\mathrm{t}), L(t)\big) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots .. \quad (1)$$

Where t, Y, K, L, and A denotes time, output, physical capital, Labour and Knowledge. The model is augmented to include number of mobile connection (M) and fixed connection (F).

$$Y(t) = f\big(K(t), A(\mathrm{t}), L(t), M(t), F(t)\big) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . \quad (2)$$

3.3 Econometric specification

The analysis will be based on the linear model specification of equation (2)

$$\mathrm{lnGDP} = \mathrm{B_0} + \mathrm{B_1 lnEmp_t} + \mathrm{B_2 lnMbc_t} + \beta_3\, \mathrm{lnFdi_t} \ + \beta_4\, \mathrm{lnFic} + \beta_5\, \mathrm{lnGcf} + \varepsilon_{\mathrm{t}} \dots \dots .(3)$$

Where,

lnGDP:	Natural log of GDP
lnEmp:	Natural log of Employment
lnMbc:	Natural log of number of Mobile connections
lnGcf:	Natural log of physical capital
lnFic:	Natural log of Number of Fixed connections
lnFdi:	Natural log of investment from abroad
e:	Error term

$B_0, B_1, , .. , B_3$ - Coefficients to be estimated.

Employment (Emp): Proxy for labour input. It is expected to increase output in line with Solow (1956) model.

Mobile connections (Mbc): expected sign is positive since increase in number mobile connections raises output to increase directly through sale of mobile phones, purchase of airtime and purchase and use of internet services. Telephone connections also reduce transaction costs and enhance productive efficiency. This is supported by Sridhar and Sridhar (2007) and others. They showed that mobile and fixed connections affect GDP positively.

Fixed connections (Fic): expected sign is positive since increase in fixed connections leads to increase in output. Chakraborty and Nandi (2011) and others found that fixed connections and GDP have a bidirectional relationship.

Foreign Direct Investment (Fdi): expected sign is positive since more FDI means more output. FDI generates spillovers as well as directly enhancing output. According to Gruber and Verboven (2001), telecommunication sector attracts FDI which eventually leads to growth of the economy.

Gross fixed capital formation (Gcf): Proxy for physical capital. It is expected to increase output.

3.4 Data and measurement

Table 3.4: Description of Variables

Variable	Definition and Measurement
Gdp	Total value (US$) of goods and services produced in a year.
Emp	Persons aged 15 years and above who contribute to production in a given period.
Mbc	This is a type of connection that is wireless. It was measured by number of accounts.
Fic	Number of active analogue fixed telephone lines
Fdi	Net investment in US$ from abroad.
Gfc	Investment level in US$ as sum of fixed assets and change in inventories.

Secondary data for the past 30 years (1989 - 2018) was considered. This data was derived from various economic databases; World development indicators, economic surveys and statistical abstracts were carefully studied to procure the needed information.

3.5 Data analysis

The first step was to carry out ADF test of unit root. The purpose is to avoid spurious regression (Gujarati, 2004). The equation is:

$$\Delta y_t = a_0 + r y_{t-1} + a_2 t + \sum \beta_i \Delta y_{t-i} + e_t$$

Where Δy_{t-i} is lagged differences; Δy_t is first difference of y_t and e_t is error term

The H_0: $r = 0$ (Y nonstationary) and H_A: $r < 0$ (Y stationary). Rejection of the null hypothesis in favor of the alternative implies that data is stationary. By not rejecting the null hypothesis, means that data is non-stationary.

Subsequently, the Johansen cointegration test was conducted to establish whether or not there was a long run relationship between the variables. The H_0 is no cointegration. Consequently ECM was specified and estimated.

CHAPTER FOUR

STUDY RESULTS

4.1 Descriptive Statistics

From table 4.1. GDP has the highest mean value of 28507.09 million US dollars followed by Gross fixed capital formation at 5448.86 million US dollars, foreign direct investment at 326.87 million US dollars, employment at 13.925 million, mobile connection at 12.356 million, and fixed connection at 0.265 million. All the variables showed a large deviation from the mean as depicted by their respective standard deviations except for fixed connections. All the variables were positively skewed except for fixed connections and mobile connections. The minimum GDP was 5751.79 while the maximum was 87908.27.

Table 4.1 Description of statistics

	Average	**Std. Dev.**	**Lowest**	**Highest**	Skewness	Kurtosis
Gdp(Million us $)	28507.09	23952.63	5751.79	87908.27	.60341	3.9113
Emp (Millions)	13.925	3.637	8.748	21.190	2.0584	9.0754
Mbc (Millions)	12.365	16.168	0	49.501	-.95828	3.4037
Fic (Millions)	.265	.138	0656	.66	-.68245	2.5191
Fdi (Million us $)	326.87	480.142	.394	1625.92	.06944	3.6262
Gcf (Million us $)	5448.86	4718.85	974.216	15236.31	.13764	1.8919

Source: Author's computation

4.2 Graphical analysis

The time plots of variables in the model are shown in the following graphs. The variables had upward trend except fixed connections that showed a downward trend from 2008.

Figure 4.2a: Natural Log of GD

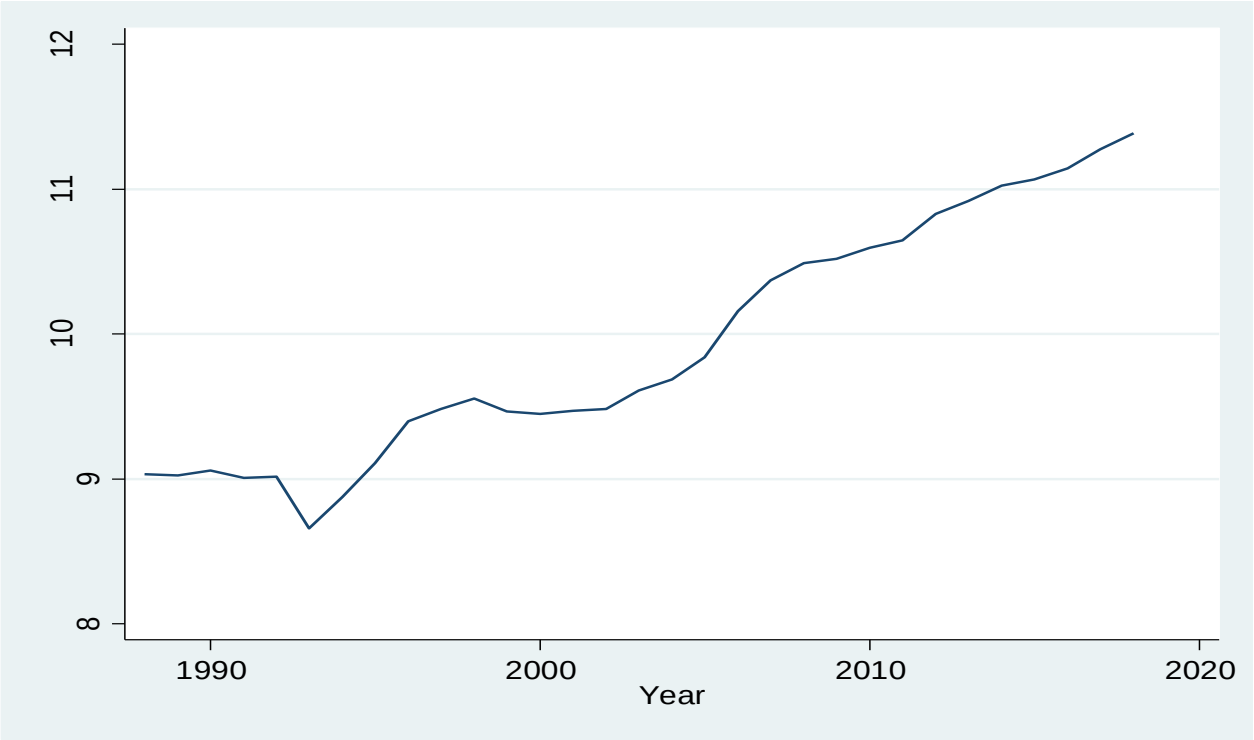


Figure 4.2b: Natural Log of employment

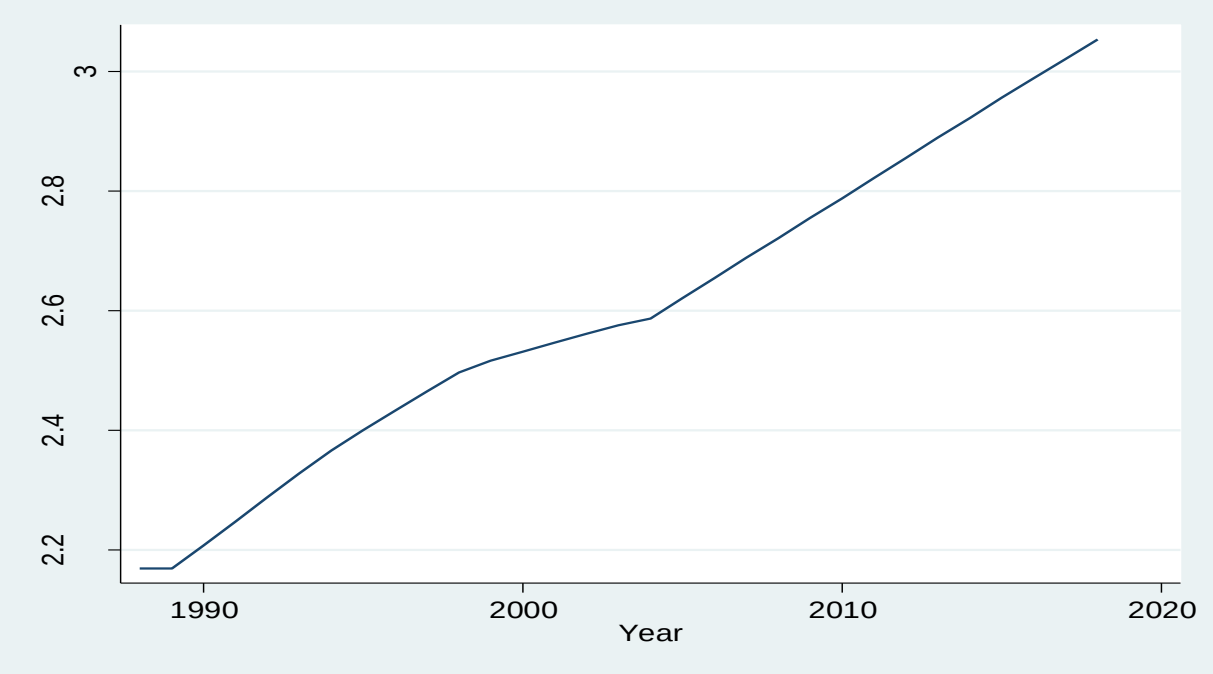


Figure 4.2c: Natural log of number of mobile connections

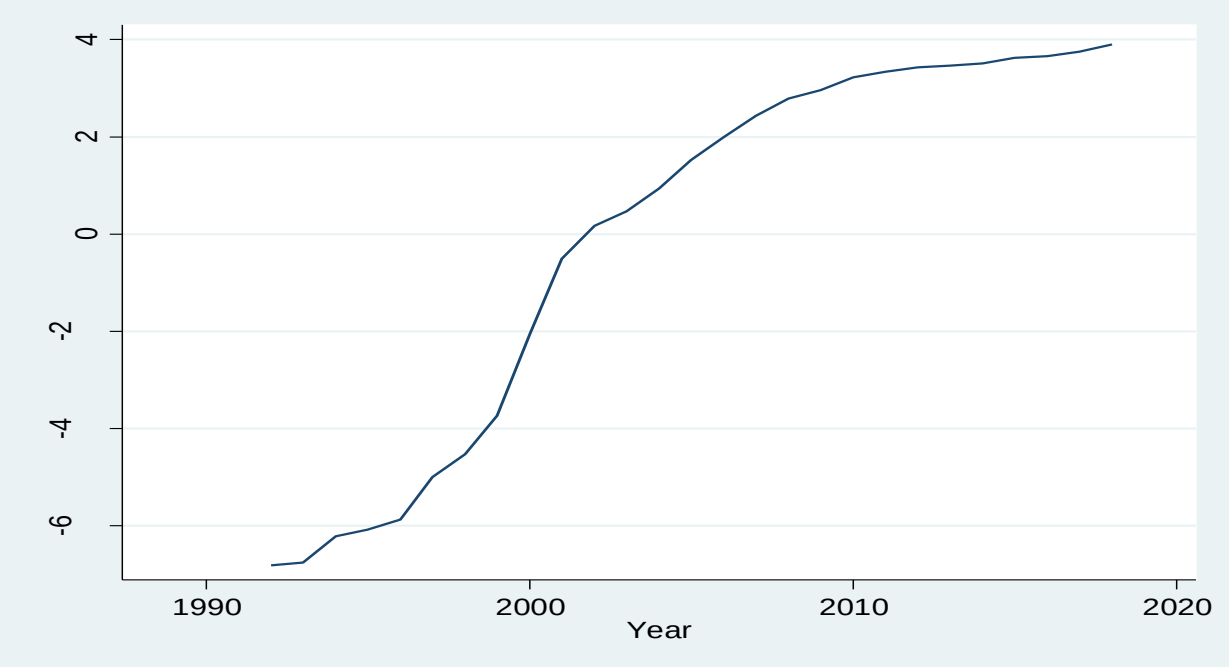


Figure 4.2d: Natural log of number of fixed connections

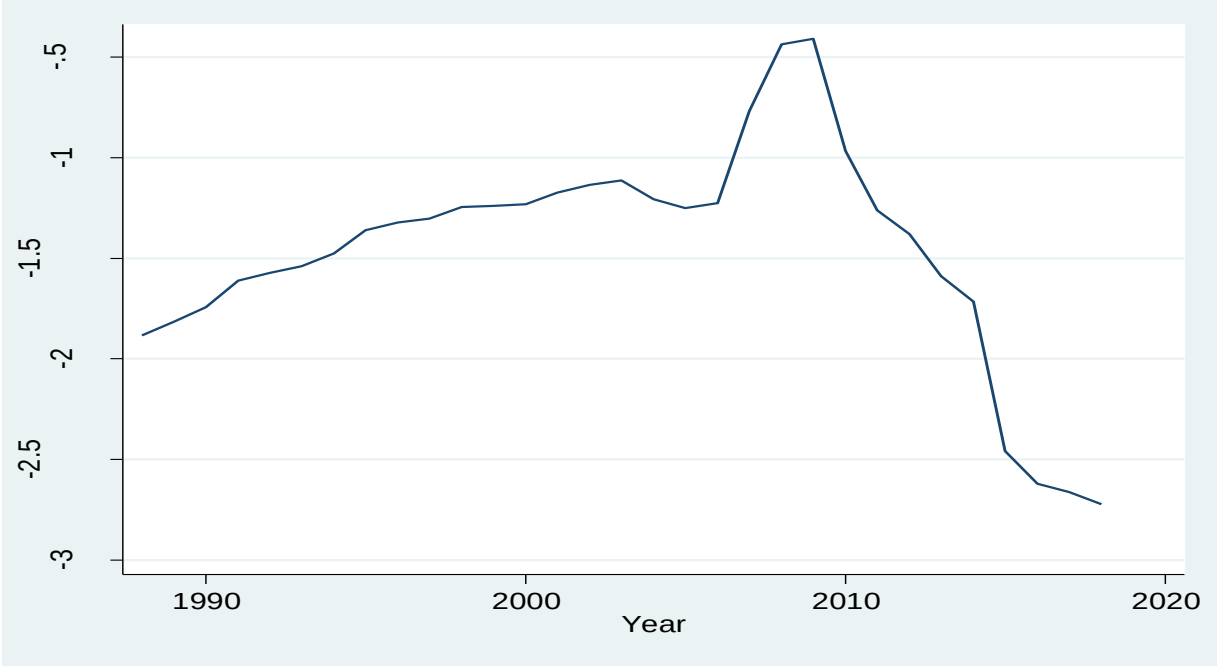


Figure 4.2e: Natural log of foreign direct investment

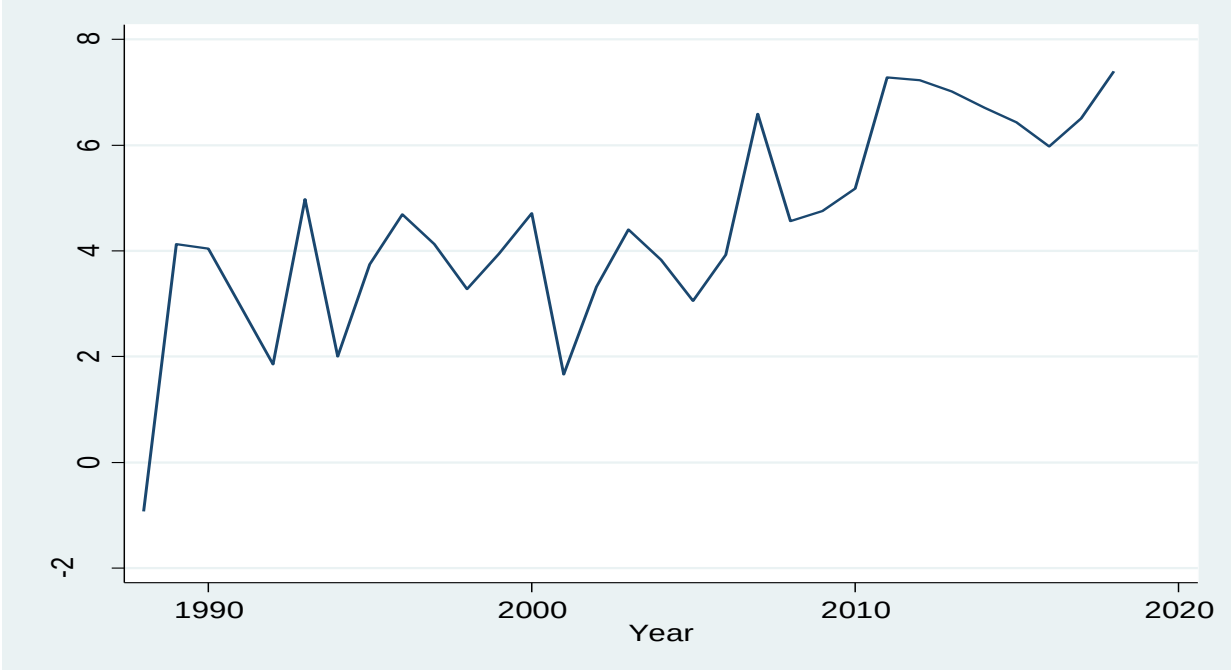
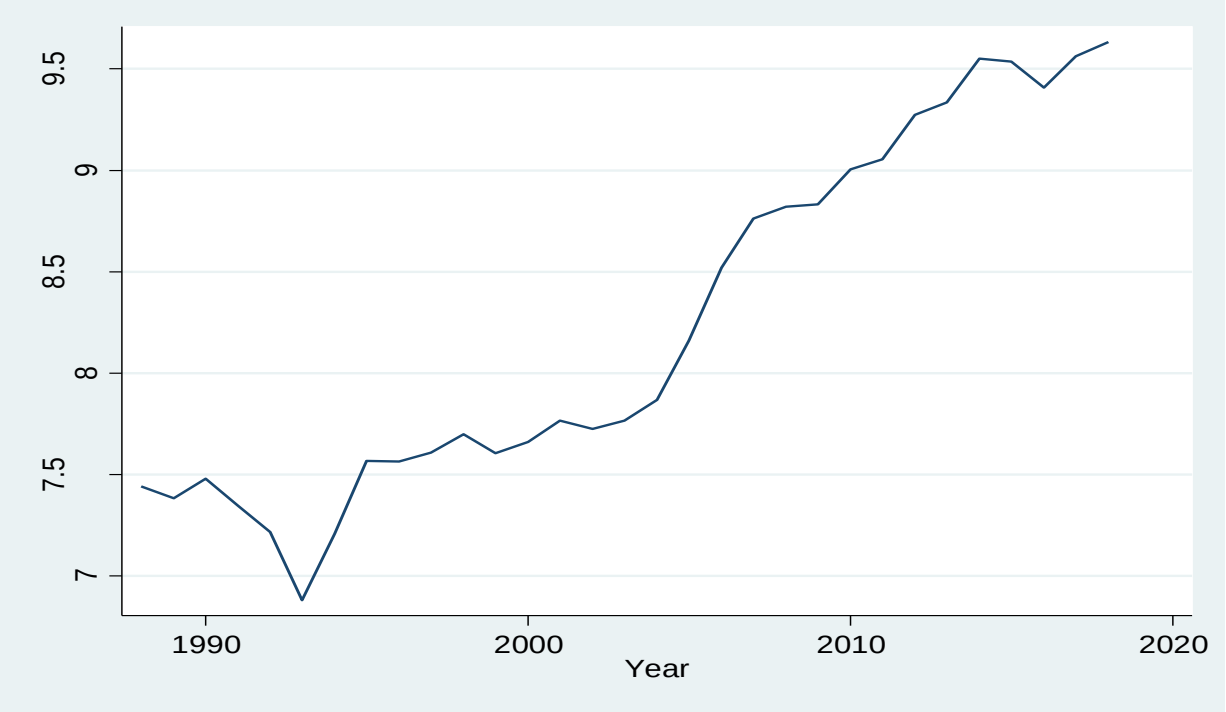


Figure 4.2f: Natural log of gross fixed capital formation



4.3 Correlation

Table 4.3 Correlation coefficient

	Gdp	Emp	Mbc	Fic	Fdi	Gcf
Gdp	1.0000					
Emp	0.9603	1.0000				
Mbc	0.9886	0.9442	1.0000			
Fic	-0.2596	-0.1157	-0.2605	1.0000		
Fdi	0.7700	0.7314	0.8000	-0.2650	1.0000	
Gcf	0.9880	0.9511	0.9873	-0.2510	0.7840	1.0000

Source: Author's computation

4.4 Normality of variables

Table 4.4: Jarque Bera test results

	Chi-square	DF	Prob > chi2
Gdp	2.763	2	0.25116
Emp	65.078	2	0.00000
Mbc	4.635	2	0.09850
Fic	2.530	2	0.28217
Fdi	0.497	2	0.77991
Gcf	1.575	2	0.45491

Author's computation

The Jarque Bera test revealed that employment was the only variable that was not normally distributed as shown by its probability (0.000) which is less than 5%.

4.5 Time series characteristics

The ADF test results with 4 lags are in Table 4.5. All series become stationary after first difference.

Table 4.5 Test statistics for testing nonstationarity

Variable	**Level**			**1st difference**			**I(d)**
	ADF stat	1 percent	5 percent	ADF stat	1 percent	5 percent	
lnGdp	-0.851	-3.716	-2.986	-4.000	-3.723	-2.989	I (1)
lnEmp	-0.583	-3.716	-2.986	-4.000	-3.723	-2.989	I (1)
lnMbc	-1.661	-3.716	-2.986	-4.273	-3.723	-2.989	I (1)
lnFic	- 0.026	-3.716	-2.986	-3.190	-3.723	-2.989	I (1)
lnFdi	-3.665	-3.716	-2.986	-8.556	-3.723	-2.997	I (1)
lnGcf	-0.434	-3.716	-2.986	-4.248	-3.723	-2.989	I (1)

Source: Author's computations

4.6 Cointegration test Results

Table 4.6 reports results of Johansen cointegration test results. Johansen implements two tests of cointegration: eigenvalue test and trace test. The methods are based on log likelihood (LL) estimators of parameters (parms) of cointegration equations. Eigenvalue is less used because it is not as robust as trace statistic (Johansen 1990). Thus the study interpreted cointegration test based on trace statistic

Table 4.6 Test for cointegration

Max Rank	Parms	LL	Eigenvalue	Trace	5%
0	114	1582.7887		1253.3146	94.15
1	125	1911.3343	1	596.2232	68.52
2	134	2209.4459	1	0.0000*	47.21
3	141	2209.4459	0	0	29.68
4	146	2209.4459	0	0	15.41
5	149	2209.4459	0	0	3.76
6	150	2209.4459	0		

Source: Author's computation

The trace statistic for equation 2 to 6 is lower than the critical values. Hence, the null hypothesis of at least two cointegrating relationship is not rejected. Given the focus on supply-leading hypothesis the study estimated an ECM model (Engle and Granger, 1987).

4.7. Parameter estimates

Table 4.7a and 4.7b present the estimates of the ECM and long run estimates respectively.

Table 4.7a: Results for short-run equation of ECM

Variable	Coefficient.	Std. Err.	z	P>|z|
ECT	-0.654	0 .130	-5.04	0.000
$\Delta \ln Gdp_{t-1}$	0.439	0.203	2.16	0.031
$\Delta \ln Emp_{t-I}$	11.560	2.738	4.22	0.000
$\Delta \ln Mbc_{t-I}$	-0.026	0.044	-0.00	0.010
$\Delta \ln Fic_{t-I}$	-0.009	0.056	-0.15	0.878
$\Delta \ln Fdi_{t-1}$	0.018	0.009	1.98	0.048
$\Delta \ln Gcf_{t-1}$	0.080	0.142	0.56	0.572
constant	0.005	0.074	0.07	0.942

Author's computation

Table 4.7b: Parameter estimate for long-run equation

	Coefficient	Std. Err.	z-value	P>|z|
lnGdp	1	.	.	.
lnEmp	-4.509	0.666	-6.77	0.000
lnMbc	0.025	0.010	2.29	0.022
lnFic	-0.104	0.043	-2.43	0.015
lnFdi	0.011	0.016	0.74	0.461
lnGcf	0.354	0.146	2.41	0.016
Cons	0.652	.	.	.

Author's computation

4.8. Discussion

According to the results in Table 4.7, the ECT coefficient is negative (-0.654) and statistically significant at 5% (p-value is 0.00 is less than 0.05). About 65.4% of existing deviation from equilibrium is corrected in subsequent period, implying a relatively high speed of adjustment.

In the short-run, telephone connection and GDP are negatively related. However, the relation is positive in the long run. The coefficient is statistically significant in the short-run and long-run (p-value = 0.022) at 5% significance level. Further, the size of the coefficient indicates that a 1% increase in mobile connection increases GDP by 0.025% in the long run.

The positive relation of mobile connection and GDP can be explained by the multiple benefits that have come up with mobile connections. These include the increased availability of telecommunication gadgets such as mobile phones, laptops and telephone line and services such as internet through liberalization of the sector which has increased competition hence provision of quality goods at a lower price. Another benefit from increased mobile connections is the reduction in transaction costs and time required in the provision of services in all the sectors that have embraced telecommunication technology. This has further increased productivity and hence improved the GDP growth. For instance, most of the government services are in recent provided through e-citizens, other services have also been enhanced through platforms such as Lipa na Mpesa. Individuals in remote areas and those not eligible for loans in financial institutions have access to loans on platforms such as KCB Mpesa, Timiza loans, and M-Fanisi.

However, from the results fixed connection has a significant adverse effect on GDP. In the short-run when fixed connections increase by 1%, GDP decreases by 0.09%, while in the long-run, a 1% increase in fixed connections causes GDP to decreases by 0.104%. The negative coefficient of fixed connections is because after 1999 the number of fixed connections was diminishing as the country embraced introduction of mobile connections (Wainaina, 2012). This could also be explained by the fact that in the 1990s the country had only one telephone service provider-Telecom Kenya as liberalization of the telecommunication sector had not yet been adopted. These results are different from those of an earlier study by Chakraborty and Nandi (2011) that showed that fixed connections and GDP reinforce each.

Lagged difference of GDP, employment and FDI are positively related to GDP in the short run. There is significant positive between employment and GDP in the short and the long run (p-value of 0.000) at 5% significance level. An increase in employment implies increased income which increases the affordability level of individuals in the society hence increased demand for goods and services which improves GDP growth rate in the country. The increased employment rate could be related to the expansion of the telecommunication sector which has provided employment opportunities on money transfer platforms such as Safaricom, Airtel, and T-Kash. Other opportunities include the installation of fiber optic cables and sale of telecommunication gadgets such as mobile phones and laptops.

FDI is positively related to GDP as shown by coefficient of 0.018 and 0.011 respectively. However, the relation is only significant in the long run at 5% significance level (P-Value of 0.048). An increase in FDI by 1% increases GDP by 0.018% in the short run and 0.011% in the long run. This was consistent with Gruber and Verboten (2001). The study also shows that GCF and GDP are positively related. This is shown by the positive coefficient both in the short and the long run of 0.080 and 0.354 respectively. A 1% increase in gross capital formation will lead to an increase in GDP by 0.354% in the long run.

4.9 Diagnostic Tests

Post-estimation tests were carried out on the model to establish the viability and reliability of the results. These included autocorrelation, normality and heteroskedasticity tests. The chi-square test statistic of Breusch-Godfrey LM test is 0.257(P-Value of 0.612)**.** Therefore, the null hypothesis of no autocorrelation is not rejected at 5% significance level.

The Chi-square test statistic Breusch-Pagan / Cook-Weisberg test is 0.87(P-Value of 0.349)**.** Therefore, the null hypothesis of constant variance is not be rejected at 5% significance level.

CHAPTER FIVE

SUMMARYAND CONCLUSION

5.1 Summary and Conclusion

The study investigated the effect of telephone connection on economic growth in Kenya using time series data for the period 1988 to 2018. There are not many studies on the role of telephone connection in the economic growth Kenya, yet telephone connections are used in transactions and communications in various sectors such as education, manufacturing, business process outsourcing among others which the country aims to reform and develop as per the Vision 2030. Telecommunication sector creates employment, reduces transaction costs and also increased productivity which are key to increased economic growth.

Annual time series data was sourced from Kenya statistical abstracts World Bank indicators and Economic surveys. GDP, fixed and mobile connections, employment, gross capital formation, and FDI variables were used. AIC revealed that four lags were optimal and were therefore adopted in the regression model. ADF test established that all the variables were stationary in first difference.

The study estimated ECM model. Prior to the estimation, unit root and cointegration test were carried out. The results confirmed the presence of long-term relationship in the series hence the use of ECM regression. From the model it was established that mobile connection, gross capital formation and FDI have had a positive long run effect on GDP growth. It was also established that fixed connections and GDP had a negative relationship. This is because fixed connections have largely been replaced by mobile connections in Kenya.

5.2 Implications of the study

The 1997 policy statement showed that the government recognized the importance of the telecommunication sector to the economic development of Kenya. Given that the telecommunication sector has proved to have enormous forward and backward linkages which are useful to the economy, emphasis should be focused on investing in the telecommunication sector.

Subsequently, other regulations have been passed to guide the operations of the telecommunication sector. These include Regulations on tariffs. Fair competition and equality, consumer protection, licensing and quality of service. These policies can be enhanced through reduction in the cost of telecommunication inputs, regulating mobile tariffs and creating a conducive environment for ensuring greater yields from the ICT sector.

The study results imply that increase in mobile connection in the Kenya leads to increased output. Therefore policy makers can expand mobile connections to increase output. This can be achieved through increasing investment in the telecommunication sector, increasing private sector control in the telecommunication sector, increasing connections in the rural areas, embracing telecommunication technology in all the sectors of the economy among others.

The positive and statistically significant effect of mobile phone connections suggests that such returns maybe present at the micro level and for other indicators of telecommunications development. Thus, future studies can focus on the role of telecommunication in firm productivity and the effect of internet usage on GDP and productivity in Kenya.

REFERENCES

Alleman, J.et.al.f 2002). Telecommunications and economic development: Empirical Evidence from South Africa. Technical report. International *Telecommunication Society,Sydney*.

Batuo, E.M. (2008). *The role of telecommunications infrastructure in the regional growth of Africa.* (MPRA Working Paper). Italy: Marche Polytechnic University.

Beil, R., Ford, G. and Jackson, J. (2005) On the relationship between telecommunications investment and economic growth in the United States, *International Economic Journal*, 19, 3–9.

Chakraborty, C., & Nandi, B. (2011). Mainline telecommunications infrastructure, levels of development and economic growth: Evidence from a panel of developing countries. *Telecommunications Policy*, 35, 441–449.

Communication Authority of Kenya (2017), *Sector statistic sectorial report.* Dec p.13

Communication Authority of Kenya (2000), *Sector statistic sectorial report*.doi. www.ca.go.ke

Gilward, A. (2005). Good intentions, poor outcomes: Telecommunications reform in South Africa. *Telecommunications Policy*, 29(7), 469–491.

Ding L, Haynes KE (2006) the role of infrastructure in regional economic growth*: the case of telecommunications in China*. Aust J Reg Stud 12(3): 165–187.

Dholakia, Ruby R., and Bari Harlam(1994), Telecommunications and Economic Development Econometric analysis of the U.S. experience. *Telecommunications Policy.* l8(6): 470-477.

Dutta, A. (2001) Telecommunications and economic activity: an analysis of Granger causality, *Journal of Management Information System*, 17, 71–95

GOK (2007),"Vision 2030" Government of Kenya. doi. www.vision2030.go.ke

Gujarati, D. (2014). *Econometrics by example*. Palgrave Macmillan.

Harald and Pantelis (2010). Mobile Communications*:* Diffusion Facts and Prospects *Communications and Strategies*. No. 77, pp. 133-145.

Hardy, A.P. (1980). The role of the telephone in economic development. *Telecommunications Policy*, 4, 278–286.

H. Gruber and F. Verboven,(2001) "The evolution of markets under entry and standards regulation — the case of global mobile telecommunications," *International Journal of Industrial Organization*, vol. 19, no. 7, pp. 1189–1212.

International Telecommunications Union (ITU) (2002): Year Book of Statistics: *Telecommunication Services*, ITU, Geneva, Switzerland.

Jain and Sridhar (2003), "analysis of Competition and Market Structure of Basic Telecommunication Services in India.

Kateja Alpana and jha Debajit (2008), "Exploring the Casual Relationship between Telecommunications and GDP Growth in India", *Artha Vijnana*, vol. No.3, September, Pg.195-208.

Norton, S. (1992) Transaction costs, telecommunications, and the microeconomics of macroeconomic growth, *Economic Development and Cultural Change*, 41, 175–96.

Qiang, C.Z. (2009). Washington. *Telecommunications and economic growth. Unpublished Paper*. DC: World Bank.

Roller, L. and Waverman, L. (2001) Telecommunications infrastructure and economic development: a simultaneous approach, *American Economic Review*, 91, 909–23.

Romer, D. (2006) Advanced macroeconomics 3rd edition Mcgraw –hill.

Shiu, A., & Lam, P.L. (2008). Causal relationship between telecommunications and economic growth in China. *Regional Studies*, 42(5), 705–718.

Solow, R. (1956). A Contribution to the theory of economic growth. *Quarterly Journal of Economics*, 70(1): 65-94.

Sridhar, K.S., & Sridhar, V. (2007). Telecommunications infrastructure and economic growth: Evidence from developing countries. *Applied Econometrics and International Development*, 7(2), 37–56.

Wainaina, M. C. (2012). *Telecommunication Infrastructure and Economic Growth: A Case of Sub-Saharan Africa (1988-2010)* (Doctoral dissertation, Kenyatta University).

Wallsten, S.J. (2001). An econometric analysis of telecom competition, privatisation and regulation in Africa and Latin America. *Journal of Industrial Economics,* 49, 1–19.

Waverman, L., Meschi, M., & Fuss, M. (2005). *The impact of telecoms on economic growth in developing countries*, (Vodafone Policy Paper Series Number 3), Newbury: Vodafone Group.

World Bank. (2000), World Bank Indicator, Washington, DC World Bank.

World Bank. (1992), World Bank Indicator, Washington, DC World Bank.

World Economic Forum: The Global Information Technology Report, 2003-04, *World Economic Forum*, Geneva, Switzerland.