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THE EFFECT OF TELECOM SECTOR LIBERALIZATION ON ECONOMIC GROWTH OF KENYA

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The effect of Telecom Sector Liberalization on Economic Growth of Kenya

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This is to certify that the thesis prepared by Mekdes Lebenie, entitled: *The effect of telecom sector liberalization on economic growth of Kenya* and submitted in partial fulfillment of the requirements for the Degree of Masters of Arts in African Studies (Human and Economic Development in Africa) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ABSTACTS

The purpose of this study is to analyze the effect of telecom sector liberalization on economic growth of Kenya using a time series data from 1988 to 2017. Empirical analysis has been performed using least square method of estimation to examine the effect of telecom liberalization on economic growth of Kenya. The variables included in the model are per capital real GDP as a dependent variable, telecom investment as key indicator for liberalization, FDI inflows, Gross fixed capital formation, Export of goods and services, Labor force and Lagged value of per capita real GDP are controlled variables. The study also examined the existence of structural change in Kenyan economy due to telecom liberalization using a linear regression model with Chow Test to determine the date(s) at which there was a statistically significant structural break. The results of the structural change indicated that the economy of Kenya has been subject to a structural break during the sample period. Given the test result proved the existence of structural change, the study introduce time variable to control for structural break and other controlled variable in order to examine the effect of telecom reform on per capita GDP growth of Kenya. Therefore, the results indicate that telecom reform has brought significant long run effect on per capita GDP of Kenya.

Key words; Economic growth; Kenya; Liberalization; Telecom investment

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Table of Continents

List of Acronyms

FDI:	Foreign direct investment
RPGDP	Real per capita GDP (Gross Domestic Products)
CCK	Communications Commission of Kenya
VoIP	Voice over IP
ITU	International Telecom Union
GFCF	Gross Fixed Capital Formation
WTO	World Trade Organization
NIE	New Institutional Economics
NEPAD	New Partnership for Africa's Development
ICT	Information and Communication Technology
VSAT	Very Small Aperture Terminal
GATS	General Agreement for Trade in Services
NCS	National communications Secretariat (NCS)
KEPSA	Kenya Private Sector Alliance
CLRM	Classical Linear Regression Model

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CHAPTER ONE

1. Introduction

1.1. Background of the study

The telecommunication industry, also referred as telecom industry, is an industry sector which is characterized by the provision of products and services that help individuals and businesses exchange information electronically over long distances (Mutungi, 2010). The development of a large-scale telecommunications infrastructure capable of delivering efficient and affordable information and communication services is a critical prerequisite for a country's economic growth and development (Mutungi, 2010). The telecommunication sector accounted for two to three percent of the GDP and services as an essential input to various sectors in the economy, (Mugogachagua, 2004).

According to Mugogachagua (2004), Africa is lagging in telecom development due to resource constraints and more than half of African countries had less than 20,000 telephones and the average penetration rate have been only 0.6 per 100 population. The author also noted that in most rural areas of Africa, there are no telephone facilities at all or if it exits, it was inadequate and of poor quality. Therefore, most Sub-Saharan African countries considered liberalization to be a useful tool to improve their telecom industry because most telecom companies in Africa are state-owned with a single supplier of all telecom services (Alemu, 2018).

In a study conducted by Chidozie (2015), telecom liberalization is reported to bring changes to sub-Saharan African countries. For example, Nigerian telecom reforms brought new multinational companies to enter the country and invest a large sum of money into the network expansion, and upgrading at various parts of the country. These operators build backup network to improve their services such as, the constructions of core network and power supply network. The author noted that, deregulation policy also leads to the spread of telephone services and expands its concentration from the urban areas to rural areas thereby bridging the gap in the social, economic and political interaction between residents (Chidozie, 2015).

Kenya's public telephone network begun service in Nairobi and Mombasa in 1908 in which there were18 subscribers being connected and subsequently, the history of Kenyan network expansion was gradual but sustained (Kane, 2002). In 1970, there were 0.6 telephones per 100 people in Kenya and it is mostly in urban areas, whereas rural areas were less served with only 7 telephones to 10,000 people (Mugogachagua, 2004).

Kenya accepted and successfully introduced competition to the telecom industry since 1999 and provide license to different operators in the markets, these include, one national operator, two regional telecom operators and 51 internet service providers (Waema, 2007). The service providers represent significant investment in the economy and the sector turns to be a big employer of staff, especially the (mobile operators) and accommodated around 20,000 people through their different retail outlets and became major contributors to national development (Waema, 2007). It is indicated that in 2005/06, the transport and communication sector contributed 10.9% to GDP, of which a significant proportion came from the telecom sector (Waema, 2007).Investments in telecom has been heavy especially in the mobile industry and Safaricom have invested around $78millon in the year 2005/06 with a revenue of $441millionand in year 2000 the number of telecom subscribers grew as a result of government licensing of new GSM (Global Systems of Mobile Communication) operators, such as, Kencell and Celtel (Waema, 2007)

1.2. Problem Statement

Telecommunication reforms formulated and implemented by the government is believed to promote economic growth and development through creating a competitive environment and opening the sector to the outside world. Liberalization policy leads to enhanced competition both in the domestic and foreign market and greater foreign investor participation in various economic activities. According to Mattoo (2006), the import of foreign factors in the form of new technology and skills will have a positive effect to economic growth. Many prior studies had been conducted on the impact of telecommunication on economic development with emphasis on

the possible relationship between the two and how the telecom sector becomes the engine of growth (Mattoo, 2006). According to Kiage (2010), there exists a positive correlation between telecommunication and economic development and telecom deregulation or opening the sector to competition and free market is important to attain social and economic goals and improve nearly all segments of the economy in Africa. Reliable, affordable and easy access to telecommunication has been identified as a key pillar to social and economic development in Africa. Furthermore, telecommunication generates 3.5 to 5.6 percent of the national GDP in Africa, a significant positive impact on economic growth (Kiage, 2010).

According to Dkhil (2014), private investors in the telecom sector may compete in two ways, namely, service-based competition in which new private investors may use the existing telecom facilities of the monopoly incumbent network and provide services, and facility-based competition in which the new entrants to the sector provide their service through establishing their own network infrastructure. It was further noted that allowing service-based competition leads to rapid development in the telecom industry in the short run through fostering innovation and price reduction, whereas facility-based entry of the private investors will promote economic growth and development in the long run even though it has high investment cost (Wieck and Vidal, 2010). Tella (2007) indicated that private sector participation in the telecom sector in the Sub-Saharan Africa like Nigerian, has led to growth to over US$6billion, from US$50million in 2001, making the sector is the largest FDI generator after oil and gas industry. Mattoo (2006), showed that countries that fully liberalize their telecom and their financial sectors expect economic growth rates up to 1.5% higher than those who did not, He added that liberalization of the sector would bring endogenous growth attributes, which are technology and innovation. Based on a study on the impact of trade openness on economic growth in Cote d'Ivoire, Keho (2017) identified that capital investment and openness to international trade have a positive impact on economic growth both in the short and long run. It was further indicated that there is a positive and strong complementarity between trade openness and capital formation in promoting economic growth in Cote d'Ivoire (Keho, 2017).

According to a study by Paleologos and Polemis(2013), effective liberalization policy that supports competition in the telecom sector tends to positively affect the level of private

investment, which in turn boosts economic growth. In the same study it was indicated that, there is a significant positive relationship between the level of deregulation and telecom investment and there is a significant positive causal link between telecommunication infrastructural investment and aggregate output measured by per capita GDP.

Kenya and other African countries accepted the WTO's liberalization guidelines and opened their telecom market to many players to facilitate growth and competition in the industry. Accordingly, the new entrants to the telecom industry had brought quality of service, affordable price and best products and services while liberalization by itself brought challenges to the new operators which include cutthroat competition, high operating expenses and biasness of government regulation (Mutungi, 2010). Openness to trade also facilitates transfer of technology and know-how, which boosts productivity as well as create competition in the domestic market and makes the local production more efficient (World Bank, 2016).

Thus, the objective of this study to analyze the effect of telecom liberalization on economic growth of Kenya. It will specifically analyze the existence of structural change in real per capita GDP and the contribution of the reform to the overall economic growth of Kenya. As several studies conducted in this area concluded, there is a positive and significant relationship between improved telecom service and economic growth, and telecom reform (opening the telecom sector to private investors) will have a significant effect on every sector in the economy. Therefore, Telecom liberalization /reform is the most important macroeconomic policy decision and showing its impact on economic growth is important for countries who are still operating under monopoly of their telecom sector.

1.3. Research Objective

The general objective of the study is to investigate the effect of telecommunication liberalization on economic growth of Kenya effected in 1999.

The specific objectives of the study are: -

- To examine the potential shift in the growth structure of Kenyan economy due to telecom reform.
- To analyze the contribution of telecom deregulation to the overall economic growth of Kenyan economy (measured as telecom investment as a key indicator for liberalization)

1.4. Significance of the Study

Numerous studies have been conducted on the contribution of telecom sector to economic growth and it was found to be positive and significant. Most of the studies were focused on the aggregate effect of telecom services to output growth and economic development in terms of employment creation and contribution to other sectors for instance, the manufacturing sector, the financial sector, and agricultural sectors. This study helps to understand the significance of competition and opening up the telecom industry to local and international investors that would promotes economic growth. In addition, the study would bring insight to policy makers and other African countries who are under preparation to open their telecom sector to local and private investors for instance, Ethiopia.

1.5. Scope and limitation of the study

The study is confined to the investigation of the effect of telecom sector liberalization on Kenyan economic growth. It is conducted based on the premise of telecom investment as a key indicator for telecom liberalization. In addition, the study only addressed a Sub-Saharan African country, Kenya, to investigate the changes in economic performance of the country due to reforms made in the telecom industry. While focusing on the real GDP per capita growth arising from telecom reforms the study does not attempt to capture the overall effects on economic development.

1.6. Organization of the study

The remaining part of the thesis is organized as follows, Chapter two is dedicated to the reviews of the theoretical and empirical literature related to the effect of telecom sector liberalization on economic growth of Kenya. Chapter three introduces the methodology and the research design of the study. Chapter four describes the findings and results of the regression and the Chow test for structural break. The last chapter, summarizes and concludes.

CHAPTER TWO

2. Literature Review

In this chapter, theoretical and empirical literature are presented. Several studies had been conducted on the effect telecommunication on economic growth, however this study focused on theories related telecom regulation and deregulation and the links to economic growth particularly on real per capita GDP growth of Kenya. The empirical literature is based on past studies conducted on the effect of telecom deregulation on economic growth.

2.1. Theoretical literature

2.1.1. The Theory of Neoliberalism

The focus of the study is to analyze the effect of telecom sector liberalization on the economic growth of Kenya; therefore, it is essential to mention the theoretical foundation liberalization. According to Kotez (2000), neoliberalism is an updated version of the classical liberal economic thought that was dominant in the US and UK prior to the Great Depression of the 1930s. Neoliberalism is both a body of economic theory and a policy stance and the theory largely emphasized on unregulated capitalist system (a free market economy). It embodies the idea of free individual choice and optimum economic performance with respect to efficiency, economic growth, technical progress, and distributional justice can be achieved (Kotz, 2000).It was further added that, the state has a very limited economic role, such as, defining property rights, enforcing contracts, and regulating the money supply. State intervention to correct market failures is viewed with suspicion, on the ground that such intervention is likely to create more problems than it solves and the policy recommendations of neoliberalism are concerned mainly with deregulation of business enterprises, privatization of public activities and assets (Kotz, 2000). In addition, neoliberalism encourages free movement of goods, services, capital, and

money (but not people) across national boundaries that is, corporations, banks and individual investors should be free to move their properties across national boundaries and also acquire property across national boundaries but free movement of individuals is not part of the neoliberal problem (Kotz, 2000).

According to Ospina(2002), the use of the term liberalization in academic literatures originates in the tradition of neoclassical economies and it implies some degree of economic competition managed or moderated through free market and it is often used interchangeable with deregulation to emphasis the decrease in government intervention or government interference with relative factor prices which should occur in movement toward free market. On the contrary Ospina(2002) indicated the views of the New institutional economics (NIE), the theory said, liberalization often involve a change, not a decrease in regulation, in other words market must be regulated to function efficiently. Therefore, telecom liberalization is defined as an increased market access for telecom service suppliers and introduce some degree of competition (Ospina, 2002).In addition, the move from monopoly to competition in basic telecommunication services would have a positive effect on affordability by increasing technical efficiency which lowers costs and results in a decrease in the price of the service. Because demand will be higher at the lower price, supply should also grow as firms compete to capture new users, thereby increasing availability (Ospina, 2002).

The rationales and goals of liberalization differ across countries, in terms of ideology, neoliberals supported the idea of less state intervention and it has been the main driving forces behind liberalization and privatization initiatives in 1980's and 1990's. In case of 1980's debt crisis and global recession, the misery of international economic environment in 1980's and the large fiscal deficit faced many LDCs provided a justification to scale down the public sector and raising revenues from the sale of state-owned telecom operators and provide licenses to additional operators to ease the state's financial crisis (Ospina, 2002).

According to Kaserman, Mayo, & Pacey(1993) explain deregulation as a major public policy reversal and with deregulation of industries, the regulator management is replaced by the invisible hand of market forces. Prices, output and investment decisions will be governed by the

market signals. The authors further explained that those highly regulated industries before will have to go through a dramatic shift in policy, and it may affect various participants in the economy and inevitably involve uncertainty (Kaserman, Mayo, & Pacey, 1993). It was further added that, WTO encourages countries to commit to sector liberalization to obtain business in trade terms and integration into the global economy and making technologically advanced telecom infrastructure as a precondition to attract investment. The underperformance and inefficiency of state-owned telecom companies and the rethinking of economies of scale in telecom have led liberalization to be viewed as a more efficient strategy.

2.1.2. Theory of Economic Regulation

Regulations as a mode of governance has spread around the world and several regulatory reforms have been made during recent decades in various countries and sectors of the economy. Some reforms aimed to install regulator system against the traditional command-and-control approaches that is state ownership as a way of directing economic activities and others are intended to reconfigure the existing regulatory system (re-regulation), others also make regulatory system less aggressive or deregulation (Asquer, 2018). It was further added that these reforms are made based on the ideological climate that favors neo-liberal approaches that depends on market-based mechanisms to coordinate economic activities.

According to Stigler (1971), in his theory of economic regulation, stated that a lot of government regulations came to existence slowly to serve industry's interests, though it was believed in early 1960 that to correct market failures. After few years of Stigler's publication of economic regulation, many industries started to deregulate the airlines, telecommunication, trucking and natural gas industries especially in the late 1970's and 1980's (Coglianese, 1971).

According to Peltzman *et al.*,(1989), the most important elements of this theory is its integration of the analysis of political behavior with economic analysis. He further added that politicians are self-interested maximizers and can influence the outcome of the regulatory process by providing financial or other support to politicians or regulators. In 1970's, there was a deregulation movement and it was a one-shot response to the macroeconomic and political condition of that

time, and it was a time of increased concern about inflation and lack of efficiency of government intervention and it was a time when most successful legislative initiatives towards deregulation born (Peltzman, Levine, & Noll, 1989). The authors further added that when the deregulation benefits become larger relative to the associated loses, the probability that the option will be exercised and if the regulation itself has generated inefficiencies and shading the inefficiencies through deregulation provides benefits (Peltzman, Levine, and Noll, 1989).

According to Asquer (2018), regulation has been adopted by many countries and sectors, and the rationale that underpin its adoption are both economic and social. The economic rationale approaches regulation is to help fix the market failures which resulted from monopoly conditions or when the client do not have adequate information about the quality and price of goods and services, on the other hand, the social rationale approaches regulation as to attain socially relevant objectives that are considered important within the given historical and political context, such as equality, fairness, ability to access, transparency and accountability (Asquer, 2018).

According to Stigler(1971), his central proposition was " regulation is acquired by the industry and it is designed and operated primarily for its benefits", that is the benefits of regulation is to grant subsidies or ban entry of competitors so that the level of price rise and profit increases so, he concluded that, regulation is designed not for the correction of the market failure but to set up income transfer in favor of the industries in exchange of political support.

In the pursuit of deregulation and privatization and free trade, an increasing number of countries have successfully implemented reforms and experienced high rate of growth and development. (Mccubbins, 1998). It was further added that, there are necessary conditions for reform to be implemented, the first necessary condition is when the government or political leaders considered reform desirable and it depends on the expected benefit for the reformer is greater than the expected benefit from doing nothing. The second one for the reform to occur is the reformer must identify plausible alternative that correspond to their preference, and thirdly, the policy makers must have the political resources to enact and implement the policy, that is, they should have the institutional means to legislate and execute the policy (Mccubbins, 1998).

In another study by Kaserman, Mayo, and Pacey(1993), in any decision to deregulate, there are numerous parties whose interest will be affected, and under the economic/interest group theory of regulation, the affected parties, in turn, exert an influence on the decision of deregulation. An alternative perspective suggested by the public interest theory of regulation suggests that decisions to deregulate is established on the broader measures whether the public will benefit from deregulation or not. (Kaserman, Mayo, and Pacey, 1993).

2.1.3. Public interest theory of Regulation

Public interest theories of regulation build on the assumption that regulation is made to pursue some designed economic objectives that benefits the society at large and it is the allocation of scarce resources for individual and collective goods (Asquer, 2018). Regulation means the employment of legal instrument for the implementation of socio-economic policy objectives and it is designed to solve problems in the working of unregulated industries or sectors and the undesirable effects of monopolies (Asquer, 2018).

According to Hertog (2003), the public interest can be described as, the best possible allocation of economic resources for the individual and collective groups. It was added that, in developed countries, allocation of scarce resource is coordinated by the market mechanism, but these conditions are frequently not met in practice. Therefore, one method of allocation of resources is through government regulation and according to public choice theory, government regulation maybe efficient when there is market failure occurred, for instance, unbalanced market operation, imperfect competition and natural monopoly (Hertog, 2003).

Deregulation on the other hand mainly concerned with economic re-regulation of sectors such as transport, airlines, telecommunication and the financial, but to fix the market failure. From the perspective of theory of public interest theories, is that the cause of market failure can be removed by technological advancement obtained from opening the sectors to international and local investors and also the demand factors, that is increased demand can change the natural

monopiles to competitive market, on the other hand technology in telecommunication can undermine natural monopolies (Hertog, 2003).

2.1.5. The Impact of FDI on economic growth of Kenya

FDI is a potential source of capital for Africa and it is more of a necessity than a luxury in fostering economic growth (Chege, 2013). FDI usually entails the importation of financial and human capital by the host economy with a measurable and positive spillover impacts on the host counties given the appropriate host country policies (Nyaga, 2013). In addition, FDI improves international trade integration and helps to create more competitive business environment and ultimately results in higher economic growth.

According to Chege (2013), African continent hopes that FDI can make up for domestic capital shortfalls, provide both technology and efficiency spillovers to local firms, and it is expected to improve integration of the continent into the global economy, spur economic growth and alleviate poverty. Many African countries have desires to improve their business to attract FDI, and the New Partnership for Africa's development (NEPAD) was launched to increase the available capital to US$64 billion through a combination of reforms, resource mobilization and create a conducive environment for FDI (Nyaga, 2013). Therefore, in Kenyan case the impact of FDI was positive to promotes economic growth and findings indicated that the Kenyan government embrace policies that aim to attract more foreign direct investment while micro-managing the same to avoid negative impacts of FDI on local firms such as crowding out effect (Chege, 2013)

2.2. Empirical literature

2.2.1. Telecommunication and Economic Growth

Telecommunication and economic growth considered to have causality relationship, it means, telecommunication development will induce economic growth and the development of economic activities at a given time may lead to increase the demand for telecommunication, in addition, telecommunication helps to reduce transaction cost in different sectors of the economy thereby induce better efficiency services (Mahbubur, 1996). According to Djiofack and Keck (2006), telecom liberalization considered is an intermediate input in the production of other goods and services and these inputs are through foreign provision of physical and financial inputs to the economy and technology transfer is likely to be generated.

According to Alleman, et al., (2014), telecommunications can increase the efficiency of economic, commercial, and administrative activities, improve the effectiveness of social and emergency services and distribute the social, cultural and economic benefits of the process of development more equitably throughout the country. Alleman, et al., (2014) further quoted from Pekka Tarjanne, secretary General of ITU that “telecommunications policies affect not only telecommunications, but also the economic growth and development” and pointed out that the sector has not been given the central investment focus in most developing countries. Investment in telecom sector can not only increase the general business efficiency but it will increase the impact of other infrastructural investment, however, the sector alone cannot be enough to ensure economic growth but lack of it can prohibit or significantly constrain economic growth and development. The author also noted that, while telecom services are the driver of economic growth and development, more investment was not directed to this area, the main reason for this was the issue of control and ownership. Most telecom companies are state enterprises in many countries and subject to standard government budget and the gains associated with telecom investment are ignored or undermined.

Telecom development affects economic growth both directly and indirectly. An efficient delivery of telecom services generates direct benefits through lower transaction cost and improve market information as well as it creates indirect effect in accelerating diffusion of information(Pradhan, et.al., 2014).In another study by Lin (2008), economic development in many developing countries are constrained due to lack of adequate telecom infrastructure and reduce efficiency throughout the economy, diminishes the effectiveness of investments and development programs, causes a comparative disadvantage in attracting investment, and lowers the quality of living standard as well as personal access to communication.

According to Aker and Mbiti(2010), referred from the (ITU, 2009) reported that in Sub-Saharan Africa, 60% of the population has mobile phone coverage and the subscription has reached 49% annually between the year 2002 to 2007, as compared with 17% per year in Europe. The report further added that telecom services brought new possibilities to the continent and it has greatly reduced communication cost, access and search for information about the market, since there is imperfect market and information asymmetry exists in the sub-Saharan Africa, therefore it improves agricultural and labor market efficiency, facilitates coordination between economic agents thereby increase market efficiency and firms productive efficiency, improves the delivery of financial, agricultural, health and educational services (Aker & Mbiti, 2010).

One of the direct impacts of telecom services in Africa is job creation and an increasing number of telecom operators joining the sector has increased the demand for labor, for instance mobile phone companies created jobs through extensive phone credit distribution network in partner with the formal and informal sectors (Aker & Mbiti, 2010). In another study by Lam and Shiu(2010), advancement in telecom technology is one of the driving forces of globalization and rapid growth of the world economy. Development in satellite, optical fiber, mobile technology, internet and the World Wide Web have greatly improved global communications and facilitated the exchange of information between different people in the world. Technological innovation in telecommunication have reduced communication costs and facilitated the globalization of production and market.

According to Heeks (2011), in Kenya, the telecom sector grew at an average of nearly 20% per year from 1999-2009 and the number of phone subscription has grown from one per 1000 adults in 1999 to the equivalent of nearly one per adult in 2010 and internet access were around four per ten adults. It was also added that, ICT has been the main driver of Kenya's economic growth over the last decade, since 2000 Kenya's economy grew at an average of 3.7% and ICT was responsible for 0.9 of the 3.7% annual GDP, in another word, ICT were responsible for roughly one-quarter of Kenya's GDP growth during the first decade of the 21st century. Investment in mobile during 2001/02 to 2009/10 are estimated at US$3.2billon and US$3 billion in fixed phone services, with broadband Internet 3billion, in addition, employment in the ICT sector is estimated to be around 100,000 in 2011 (0.7% of the estimated 14millon overall labor force) (Heeks, 2011).

2.2.2. Telecom investment and economic growth

In most developing countries, telecom service providers were state-owned, state operated, but nowadays, policy makers have realized the significance of private participation in the infrastructural facilities in the sector to boost their economies (Karner and Onyeji, 2007). It was further noted that, private sector participation in telecom sector is expected to expand and improve services, create incentive for efficiency and reduce the burden on public resources, in addition, private provision of telecom service is expected to lead to greater efficiency through technological spillover to other sectors which has a long-lasting effect on the economy as we . In most developing countries insufficient resources to finance long term investment is a major drawback and this lack of finance is a big set-back to economic growth, therefore, having private investors in the telecom sector is seen as an avenue to get the required funds for investment, so most countries have opened their sector to achieve this objective (Karner & Onyeji, 2007).

According to Paleologos and Polemis,(2013) effective regulatory environment in the telecom sector does affect the level of economic growth, in other words, regulatory environment will be associated with better performance in the economy as measured by per capita GDP and effective

implementation by national regulatory authority in order to foster competition helps to encourage private investment (Paleologos & Polemis, 2013).

In another study by Marmefelt(2012), telecom investment has direct and indirect effect on economic growth. It directly attracts FDI through which inflow of foreign capital increase in the country. Foreign companies and service providers invest in country which leads to new employment opportunities and competitive market environment and indirectly, it reduces transaction cost of numerous markets in the economy which leads to higher aggregate output and growth (Marmefelt, 2012).

2.2.3. Telecom service in Sub-Saharan Africa

Many African countries have recognized the importance of telecommunication to economic growth and many efforts had been made through deregulation, restructuring in the form of ownership to make to create a suitable environment to foreign and private investors and for the expansion and modernization of telecom system (Rahman, 2018).

According to Djiofack and Keck(2006), many African countries, since year 2000 telecom sector had boomed, especially in mobile and internet segments. The author as cited in, ITU (2004) report estimated that African telecom operators in 2003 realized more than $10billion in revenues and had been realized due to telecom reforms carried out over the last seven to eight years. Many African countries abolished traditional monopolies and allowed new telecom operators to compete and created regulatory framework.

In another study by Rahman,(2018), in response to the changes made in the telecom sector and technological innovation to keep in pace with the global economy, most developing nations have already restructures their telecom sectors through deregulation, privatization and inducing competition at different levels of the market, furthermore, traditionally telecom sector was highly regulated and monopolized in developing countries including Africa. However, as the economy grows, the demand for improved telecom services with a lower cost increased and the monopoly

arguments eventually weakened (Rahman, 2018). The author also reinforced that most state-owned telecom companies have a scarcity in of capital resources, and not suitable to foreign private investment, hence it becomes the major impediment in the expansion and modernization of telecom infrastructure in Africa, therefore, it was suggested that liberalization and privatization maybe the best strategic choice.

According to Minges, et al., (2008), countries in most Sub-Saharan Africa pursued early market liberalization for mobile telephone and had an average penetration level that was 2.2 points higher in 2005 than would be expected from their average income. Those countries who have not liberalize their telecom market, their average mobile penetration rates of 2.1 below the level of their income and it was evident that the gap between countries that are reforming and those that are not is getting wider. Since 1993 most African counties have introduced some degree of competition in their telecom market and leaving Ethiopia as the only country where no process is underway to liberalize the telecom sector (Minges, et al., 2008).

According to Djiofack and Keck(2006), seven countries had committed to market access or partially and fully introduced liberalization and open their sector to for foreign telecom suppliers in the basic telecommunications are Côte d'Ivoire, Ghana, Kenya, Mauritius, Senegal, South Africa and Uganda. As the below table illustrates, all African countries introduced telecom reforms except some few countries still embraced monopoly in their telecom services, exceptionally Ethiopia's is the only country that fully monopolized all telecom services. In addition, most African countries liberalize their telecom sector in late 1990's and there exist a regulatory authority in some countries and absent in other counties even there is a competitive environment (Djiofack and Keck, 2006).

According to Mattoo (2006), when a country considers full liberalization of telecom sector, it must introduce competition, FDI is allowed, and must exist an independent regulatory authority, and in case of partial liberalization it is interpreted as a situation where one or two of these elements is missing, and none of the elements are present is regarded as no liberalization. The below table illustrates the status of African countries, which are fully liberalized all their telecom services, partial and no liberalization (under monopoly).

Africa is undergoing a revolution in information and communications and technology (ICT) that is bringing telecom services within the reach of hundreds of millions of people (Minges, et al., 2008). In most African countries the primary determinates of access to telecom services is price which is high by international standards and in relation to household income. There is also a great variation across countries with average mobile prices ranging from a high of US$24.45 to a low of US$4.07 and the average fixed line packages covers a similar range from less than $5per month in Ethiopia to more than $30 per month in Côte d'Ivoire, furthermore, the high price of telecom service in Africa is taxes on import duties, as a result many citizens become outside the reach of telecom services (Minges, et al., 2008). The author concluded that competition is the quickest route to lower prices and wider access to telecom services and the most important implication has been the shift from monopoly to competition, greater competition has brought expanded network, lower prices and new effort to reach previously underserved group of customers.

2.2.6. Relationship between telecom reforms and economic growth

According to Djiofack and Keck (2006), in most African countries' liberalization of telecom sector allows new operators to enter the market and avail their services, especially in the mobile phone, widespread availability allows people in remote locations to communicate with affordable prices, in addition, it enables them to establish market relationship, reduce transaction cost, broadening trade networks, increased mobility and facilitates and create a conducive environment to higher economic growth. The authors added that as the number of mobile users increases by one percent it translates into 0.5 percent increase in the level of real GDP per capita in Africa. According to Zahonogo (2017), openness to trade or liberalization is indeed positively related to economic growth through facilitating the diffusion of knowledge and technology and

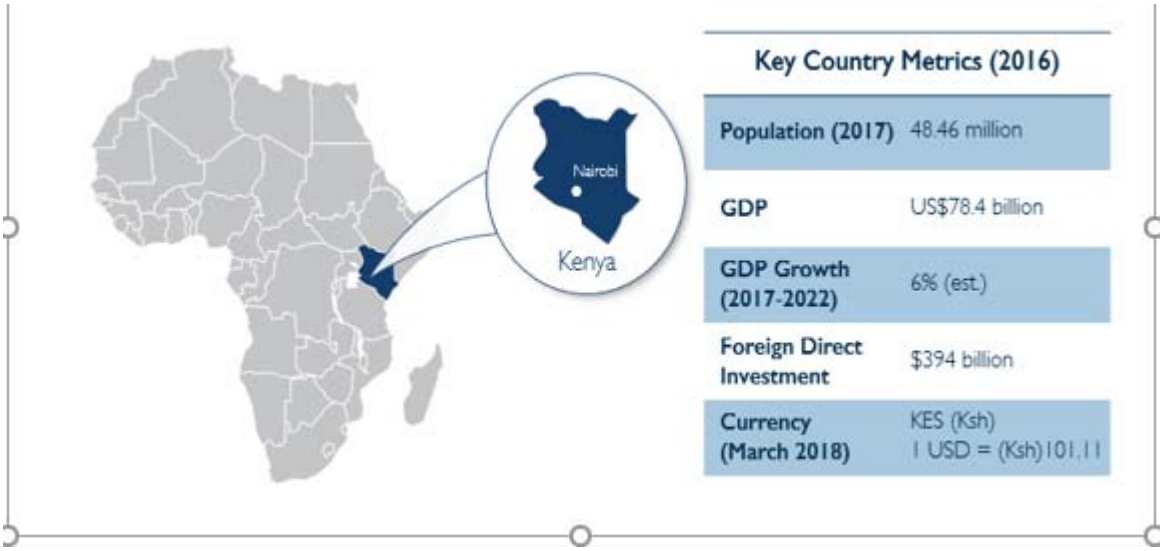
enhance gains from FDI. It was further noted that, trade openness allows economies to better capture the potential benefits of increasing returns to scale and economies of specialization.

According to Mattoo(2006), restriction in trade in goods will reduce the level of real GDP, which is equivalent to lose of welfare, and the restriction in services can also be expected to have similar welfare costs, as to create a gap between domestic and foreign priced of services. It has been suggested that services are inputs to the production and inefficient production due to services acts as a tax on production and therefore, goods liberalization in the absence of services liberalization will resulting in lowering the effective of production of goods and have impact on GDP (Mattoo, 2006). The author finally added that, if service liberalization accompanies technology transfer, either through FDI or other means, the growth effect will be stronger and its spillovers due to the local presence of foreign factors enhance the productivity of nationally owned factors (Mattoo, 2006).

Deregulation goes hand in hand with increased innovation, which can be measured by the availability of advanced telecom services and technology. In addition, it appears to be a strong correlation between countries that have deregulated telecom sector and their overall competitiveness in the global economy taking technology as a key determinant of a country's competitiveness and growth (Evan, 2005).

According to Laverty (2011), the purpose of reform was to increase the performance of institutional structures due to changing social, political, and economic circumstances. The national telecom monopolies could not meet the requirements of the new era of ICT and changes such as advances in technology and the new critical role that ICT played in economic growth and development were two such changes that a state monopoly could not take advantage of. The first step in reforms is institutional restructuring that is, effectiveness in ICT market will depend on solid legal foundation that are regulated by competent and independent system as well as the need to separate the public telecom operator from the government and politicians so that no political interference. Therefore, the regulator needs to be independent of the public telecom operators in addition to the government so this will enable the body to act as a buffer to separating the telecom and the government (Laverty, 2011).

2.2.7. Kenya's telecom sector and the economy



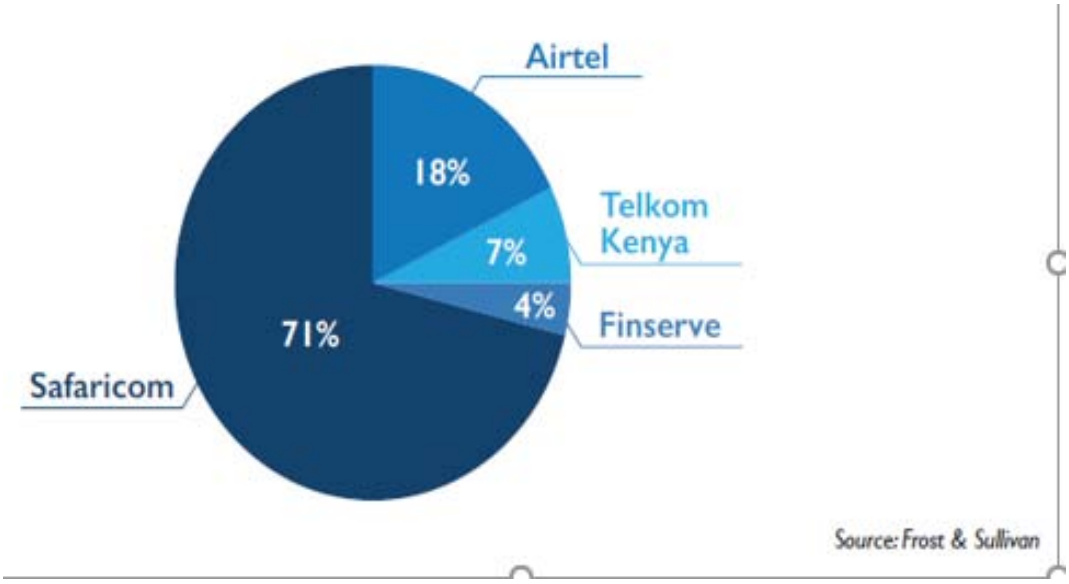
Source: Frost & Sullivan 2018, (p.4)

Fig. 1: Kenya Demographics and Country Metrix

Kenya is a key player in East Africa and the country has an important Indian ocean port and strategic land borders with Ethiopia, South Sudan, Uganda, Tanzania and Somalia. The country's GDP was estimated at $78.4 billion in 2016 and growth rate 5.7%, 5.8% and 5% in 2015, 2016 and 2017, respectively (Frost & Sullivan, 2018). It was also added that in recent years, Kenyan growth was expected to slow as a result of drought, weak credit growth, security concerns rising oil prices and political uncertainty following the 2017 election. Kenyan economy is dominated by the service sector, it makes up to 45% of GDP, this is unusual in most developing countries as agricultural sector often dominates and agricultural sector is the second segment of the economy at 36% of GDP and industry makes up the remaining 19% and the Kenyan telecom sector was worth an estimated 3.2 billion in 2017, (Frost and Sullivan, 2018).

Kenya's population is comparatively well educated in terms of literacy rate (78%) and larger rural population implies that there is easily addressable market for Telcom services providers and the market in Kenya comprises three mobile network operators, one fixed line operator.

Safaricom is the largest mobile network operator and has a market share over 70%. Airtel and Telkom Kenya hold 17.6% and 7.4%, respectively 23 smaller Mobile Virtual Network Operators (MVNOs) control the remainder of the market, (Frost & Sullivan, 2018)



Source: Front and Sullivian, 2018, p. 9

Fig. 2: The share of Kenya's Private telecom operators

According to Kenyan Private Sector Alliance KEPSA (2005), the country in early 1990's embarked on structural and macroeconomic reforms in all sectors of the economy as a means of establishing the framework to create conducive environment to higher economic growth. Chidozie(2015, p. 5) indicated that reforms are important tool to improve the overall economy to ensure efficiency and effectiveness in utilizing resources, reduction of government debt, income generation for the government and promote free market. Therefore, Kenya apart from telecom reforms made other restructurings in the agriculture sector and international market liberalization through exchange rate deregulation (Parto, 2009). Despite this reform, Kenya's economy performed poorly in 1990-2001 due to various factors, but most importantly due to lack of private investment, low savings and excessive government borrowing (KEPSA, 2005). According to Parto (2009), in early 1990's growth in per capita GDP of Kenya were stagnant and the negative growth trend followed in the second half of 1990's and showed some recovery sign between 2003 and 2005.

According to Kane (2002), the overall performance of Kenyan economy and particularly the telecom had shown changes after the new telecom act 1998 went into effect in July 1999 and Communications Commission of Kenya (CCK) was established as a regulator to advise the government in relating to communication. The new act provides the split of the incumbent operator Kenya Postal and Telecommunication Corporation into three bodies. This includes, the Postal Corporation of Kenya, Telkom Kenya Ltd, and CCK (Kane, 2002). Telecom Kenya Ltd. was established as a public telephone operator which is owned by the government of Kenya and it had an exclusive monopoly over the local telephone, national long distance, international and internet services. Around 2004, the era of monopoly of Telecom Kenya was ended and CCK has started the process of liberalization (Kane, 2002).

In other hand, the National communications Secretariat (NCS) advises the government of Kenya, through the Ministry of Information and Communications on ICT policy and among the goas was to pay a particular attention to policies that promote the development of technological capabilities, deliver social services and forester economic growth and encourages competition and efficiency in the industry (Waema, 2007).

The performance of various telecom services, for instance fixed line network has largely stagnated and the number of subscribers had declined from 2002-2005 (Waema, 2007). On the other hand, the mobile network surpasses the fixed network in in 2000/2001 and has since the experienced phenomenal growth and by 2006/2007, the mobile network was over 20 times the size of the fixed network. Although mobile services are more expensive than fixed services, users enjoyed the benefits of mobility, reliability, and better customer services while the internet services in Kenya have not been experiencing the kind of growth experienced in mobile segment despite sustained liberalization in the internet market and the cause for this decline was due to a relatively high usage charge of internet (Waema, 2007).

Kenya's telecommunications market is expected to grow from $2.74 billion to $3.49 billion in 2022. Growth is predicted to be driven by rapidly increasing demand for mobile data as businesses and consumers increasingly rely on these devices.

Kenyan government embarked policy reform prescribed by WTO and the shift from the government institution as the only supplier of telecom services to the private sector operators based on competitive market forces (Mureithi, 2002). In 1982 Kenya hosted the first international telecom union conference in Sub-Saharan Africa that recognized the critical inadequacy of telecom in Africa and the key component of the strategy were to commercialize the provision of telecom service and provide in a multi-operator environment and the essence of telecom policy reform in Kenya is to optimize its telecom sector contribution to the development of the Kenyan economy as a whole by ensuring efficient, reliable, and affordable communications services throughout the country (Mureithi, 2002).

According to Mureithi (2002), due to the policy change in Kenya, new private investors in the telecom sector emerged, 3 mobile telecom operators (Safaricom, Airtel, Liquid) and Telekom Kenya is the only landline operator and provides VoIP, international calling, roaming. In addition, 72 Internet Service Providers and 3 VSAT operators were introduced and the new operators have been successful in raising capital for development in local market, for example, Safaricom in Kenya has raised US$84 Million in two years from the local market and FDI inflows from the sale of new operator licenses has contributed to the Kenyan national income. It was further added that Kenyan telecom policy regarding foreign investor was different, for example, until 2001 equity ownership in Kenya was restricted to 40%, on the contrary, Uganda has no restriction of foreign ownership.

According to Otieno amd Aligula, (2006), Kenya's current trade regime is fairly open and competitive due to the liberalization process initiated in the 1990s. Liberalization was carried out as Kenya accepted to the General Agreement for Trade in Services (GATS) under the World Trade Organization (WTO) in 1995. Before liberalization of the sub-sector, services were delivered within a monopolistic public sector structure- the Kenya Posts and Telecommunications Corporation. It was indicated that due to liberalization of the sector, there has been tremendous growth especially in the mobile telecom industry, which currently 6 billion subscribers. Furthermore, access to services has improved both in the urban and rural areas and

the introduction of mobile technology and Internet services has also created an impact in terms of access to information, employment creation –both directly and indirectly through participation of micro and small enterprises benefiting from community phones, sale of mobile phones and accessories which has an impact on incomes and poverty reduction, all in all what used to be a monopolistic public sector driven service has been gradually transformed into a competitive and growth oriented sector driven by private sector and foreign capital (Otieno & Aligula, 2006).

Therefore, the reforms have unleashed resources from the private sector to expand the infrastructure and generally made services cheaper and more accessible in Kenya and the policy reform helped clarify the role of the government as a facilitator and gave space to the private sector to contribute in the development of the country (Mureithi, 2002).

CHAPTER THREE

3. Research Design and methodology

3.1. Research Design

The study used a quantitative approach to analyze the effect of telecom liberalization on economic growth of Kenya using OLS method of estimation and regression analysis by taking telecom investment as a key indicator for liberalization and other variables, per capita real GDP as a dependent variable, (FDI inflows, gross fixed capital formation, labor force, Export of goods and services, and lagged value of per capita GDP as explanatory and controlled variables. investment while controlling other variables. The study is based on a country level macro data covering from 1988-2017 and, it is a time series data obtained from World Bank and other relevant date sources such as, journal articles, research reports, database, books.

As the data is time series, various tests were performed including testing for stationarity (Unit Root Test), test for Multicollinearity, Heteroscedasticity and Autocorrelation and cointegration. In addition, the study used Chow Test to investigate the existence of a structural break in Kenyan economy due to liberalization.

3.2. Method of Data Analysis

3.2.1. Model Specification

The study used chow test for structural break due to telecom liberalization. The model used F-test to determine whether a single regression is more efficient or become the best fit using the whole data or separate regression or splitting the data into two sub-samples.

3.2.1.1. Model for structural break

The study applies structural beak test to see if there is a shift in growth of Kenyan economy due to telecom reforms. Therefore, a Chow test is used to test the structural stability. The model usually takes F-Teste to determine whether a single regression line is more efficient than two separate regression lines through dividing the samples date into two sub-samples. The single regression line can be estimated using the whole data set with the following formula: -

$$\text{Time Period } 1988-2017:\ \ PRGDP_t = \beta_1 + \beta_2 TInv_t + \varepsilon_t \qquad n_1 + n_2 = 30$$

The following two formals is used to estimate separate regression line by dividing the dataset into two sub-samples. Where the first formal applies for before the break time at time *t* and the second formal applies for after the structural break at time *t*.

$$\text{Time Period } 1988-2003:\ \ PRGDP_t = \alpha_1 + \alpha_2 TInv_t + \varepsilon_{1_t}. \qquad n_1 = 16 \quad (1.1)$$

$$\text{Time period } 2004-2017:\ PRGDP_t = \gamma_1 + \gamma_2 \varepsilon_{2_t} + \varepsilon_{1_t} \qquad n_2 = 14 \quad (1.2)$$

The null hypothesis is no difference between the fit in the full and sub-samples of the date that is, no structural beak (H_0: $\alpha_2 = \gamma_2 = 0$) and the alternative hypothesis is, there is a structural break (H_1: $\alpha_2, \gamma_2 \neq 0$) The variables in the model are real per capita GDP at time *t* denoted by ($PRGDP_t$) and telecom investment at time *t* denoted by $TInv_t$.

The equation for structural break is estimated using the data from total telecom investment in a year from 1988-2017 and to see the change in the growth rate of real per capita GDP of Kenyan economy before and after telecommunication reform.

The study conducted multicollinearity test using Breusch-Pagan-Godfrey test to determine whether there is a relationship between the independent variables on the time series data. To test for multicollinearity problem the study used, Variance Inflation Factor (VIF). Thus, the null

hypothesis is that there exists no multicollinearity between independent variables and the alternative hypothesis is there is multicollinearity between the independent variables.

3.2.1.2. Regression model

The aggregate analysis uses linear regression model based on time series data to analyze the contribution of telecom deregulation to the overall economic growth with respect to time and telecom investment while controlling other variables. The variables included in the model are real per capita GDP, FDI, total labor force (LF), Gross Fixed Capital Format (GFCF), total exports of goods and services (X), and lagged value of per capita GDP.

$$\mathbf{PRGDP_t} = \gamma_0 + \gamma_1 \mathrm{TInv_t} + \gamma_2 \mathbf{LF_t} + \gamma_3 \mathrm{PRGDP}t_{-1} + \gamma_4 FDI_t + \gamma_5 \boldsymbol{GFCF} + \gamma_6 \boldsymbol{X_t} + \in_t \qquad (2)$$

Where in equation (2), $\mathbf{PRGDP_t}$ represents the annual growth rate of real GDP per capita, $\mathrm{TInv_t}$ is the total telecom investment in a year *t*, $\mathbf{LF_t}$ is the total labor force in a year *t*, $\mathrm{PRGDP}t_{-1}$ is the lagged/previous value of real GDP per capital, $\boldsymbol{FDI_t}$ is the total foreign direct investment I inflows in a year *t*, $\boldsymbol{GFCF}$is Gross Fixed Capital Formation in year *t*, $\boldsymbol{X_t}$ is the total Exports during a year *t* and $\in_t$ stands for error term. The null hypothesis for this model is telecom reform will not promote economic growth and the alternative hypothesis is telecom reform will promote economic growth.

3.2.2. Variables included in the Model

Per capita real GDP

The dependent variable per capita real GDP is used to examine the behavior of Kenyan economy over the past several years and to evaluate the changes in growth due to telecom liberalization.

Telecom investment

Telecom investment, *Tinv*, is an explanatory variable which is used as an indicator for telecom liberalization. According to Paleologos and Polemis(2013), there is a significant positive causal link between telecommunication infrastructural investment and aggregate output measured by per capita GDP. Hence, the variable is expected to have a positive effect on per capita real GDP growth rate.

FDI inflows per year

Annual Foreign Direct Investment, *FDI*, is one of the control variables included in the model. It indicates the total foreign direct investment inflows during the year.

FDI can affect economic growth through capital accumulation in the host country in terms of introducing new inputs and technologies; it can also raise the level of skills and knowledge in the host country through training, and management skills and increase the level of competition in the host country trough reduction in entry barriers and inviting foreign and local investors, (Awolusi and Adeyeye, 2016). David Ricardo's theory Comparative advantage clearly establishes the inevitability of FDI as a foundation upon which a nation's economic growth and prosperity can be built. Awolusi and Adeyeye, (2016) give further explanation connecting FDI for African countries growth and development and it was observed that 1% increase in FDI would result in a 0.12% increase in GDP for South Africa, a 0.05% increase in Egypt, a 0.03% increase in Nigeria, a 0.02% increase in Kenya, and a 1% increase in GDP in the Central African Republic. Accordingly, FDI is hypothesized to be positively related to per capita GDP.

Total labor force

Total Labor Force, *TLF*, is a control variable indicating the contribution of labor force participation to GDP growth. According to a study by Rahman (2018), an increase in labor force

participation has a direct positive impact on countries' GDP. Hence, total labor force is expected to have a positive effect on per capita real GDP growth.

Gross Fixed capital formation

Gross Fixed Capital Formation, *GFCF*, one of the control variables, indicates the contribution of capital formation to economic growth. According to a study by Gibescu(2010), there is a direct and strong connection between GFCF and economic growth. Based on this, Gross Fixed Capital Formation is hypothesized to have a positive effect on GDP growth.

Export of goods and services

The variable export of goods and services, *X*, is one of the control variables that captures the role of international exchange on economic growth. It is indicted that the export of goods and services and GDP per capita are linearly related and exports is a source of economic growth (Bakari and Mabrouki, 2017). Hence, export is expected to have a positive relationship with GDP growth.

Per capita Real GDP one period lagged

The variable per capita real GDP lag, $PRGDP_{t-1}$, is a one period lag variable, and it is one of the control variables that captures the effect of the previous year GDP on current period. Hence, the previous year GDP is expected to have positive effect on current year GDP growth.

Table 2:- Variable definitions and their expected signs

Variables	Description of Variables	Measurement	Expected Signs
Dependent Variable			
PRGDP	Per capita Real GDP	Average growth of per capital GDP adjusted for inflation (US$)	+
Explanatory Variables			
TInv_t	Telecom Investment	Average telecom investment made from the period 1988-2017 (US$)	+
FDI_t	FDI inflows per year	Average value of FDI inflows 1988-2017 (US$)	+
LF_t	Total Labor force	Average number of labor force engaged during the period 1988-2017 (%)	+
X_t	Export of goods & services	Average value of Exports of goods & services during 1988-2017 (US$)	+
GCCF	Gross Fixed Capital Formation	Measures the level of fixed physical capital formation per year (US$)	+
$PRGDP_{t-1}$	Real per capital GDP lagged	Measures one period lag value of Per capita real GDP (US$)	+

3.2.3. Econometric analysis

3.2.3.1. Stationarity

When dealing with time series data, it is necessary to assess whether the series is stationary or not. The reason behind is that regression with a non-stationary series may lead to unrealistic result or what is known as spurious regression and it is economically meaningless, (Gujarati, 2004). If a series is non-stationary, it may exhibit an upward or downward trend and the regression result with non-stationary time series will lead to bias because variables may not be related but misleadingly shows high degree of relationship or high R^2 (Gujarati, 2004). Therefore, a stochastic process is said to be stationary, if the mean and variance is constant over time or the observation is not time dependent.

According to Libanio (2005), if a series has no unit root (or is stationary), it fluctuates around a constant long run mean and absence of unit root implies that the series has a finite variance which does not depend on time which is critical for economic forecasting. Alternatively, if the series has a unit root (or is non-stationary), it has no tendency to return to a long run deterministic path, the variance of the series is time dependent and goes to infinity as time approaches infinity, which results in serious problems for forecasting (Libanio, 2005).

The standard approach to investigate the stationarity of a time series is through Augmented Dickey Fuller Test (ADF) and it can be estimated through the following specification:-

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \gamma_1 \Delta Y_{t-1} + \ldots + \gamma_n \gamma_2 \Delta Y_{t-n} + \mu \quad \text{or}$$

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \Sigma \gamma_i \Delta Y_{t-i} + \mu_t$$

Where; ΔY_t is the difference of the dependent variable ($\Delta Y_t = Y_t - Y_{t-1}$), β_0 s intercept, δ is the parameter to be estimated for the lag of the dependent variable, $\beta_1 t$ is a time or trend variable. According to Gujarati(2004), a trend can be deterministic or stochastic; if the series shows a stationary series, it can be concluded that the series is a deterministic trend, and if it shifts over time, it is stochastic, or non-stationary time series. γ_1 is the parameter of the lag of the differenced dependent variable and μ_t is error term. The optimal lag length n needs to be determined so that the residuals are not serially correlated, that is, the error terms in a time series transfers from one period to another. When too small n is chosen, the remaining serial correlation in error term will bias the estimates, and too large n is also affects the power of the test, therefore the lag difference should be optimal that the error terms will be serially independent (Gujarati, 2004).

The null hypothesis is ($H_0: \delta = 0$) or $\delta = 1$), that is a unit root exists, against the alternative hypothesis ($H_1: \delta < 0$). A rejection of a null hypothesis means that the times series is stationery and failure to reject the null hypothesis indicates the time series is non-stationary. If the time series shows non-stationarity, we can transform it to stationarity using differencing.

Long Run relationship: Co-integration

Most macroeconomic variables are found to be non-stationary and showing trending overtime. However, one can difference or detrend the variables in order to make the variables stationary. If variables are stationary through differencing, they are in the class of difference stationarity process. On the other hand, if they are detrended, they are trend stationary (Gujarati, 2004). Thereore, the study used Johansen co-integratin test to examine the long run association of the dependenent and independent varaibles.

Vector Error Correction (VEC)

VEC enables to captue the short run and long run causialtiy between variables based on ideintified long run relatiohsip. If variables are cointegarted, we can use VECM to analyze the short run dynamies and long run causialty between variables.

Table 3 : - Summary of the links between the overall objectives, variables, models, and hypothesis of the study

Specific Objectives	Variables/Indicators	Data source	Data Analysis method	Model	Hypothesis
1. To examine if there is a shift in the growth structure of Kenyan economy due to telecom liberalization	1. Dependent variable - Per capita RGDP Explanatory variable - Telecom investment	World bank (WDI) and Int'l Telecom Union (ITU) database and other local sources	• Descriptive statistics • Chow test for structural break	$PRGDP_t = \beta_1 + \beta_2 TInv_t + \varepsilon_t$.....(1) (for the whole dataset) $PRGDP_t = \alpha_1 + \alpha_2 TInv_t + \varepsilon_{1_t}$.... .for the data before deregulation $PRGDP_t = \gamma_1 + \gamma_2 TInv_t + \varepsilon_{2_t}$ ....for the data after deregulation Where: - PRGDP : per capita real GDP - TInv : Telecom investment - α_1, α_2 β, $\beta_1, \beta_2, \gamma_1, \gamma_2$ are parameters to be estimated	H_0 = There is no difference between the fit in the full and sub-samples (no structural break due to telecom investment) H_0: $\alpha_2 \neq \gamma_2 = 0$ H_1= There is a difference between the fit in the full and sub-samples(there is a structural break due to telecom investment) H_1: $\alpha_2 = \gamma_2 = 0$
2. To Assess the contribution of telecom sector deregulation to the economic growth of Kenya	Dependent Variable • Per capita RGDP Explanatory Variables - Telecom investment (% of GDP) - Total labor force - FDI inflows per year (in million US$) - Export of goods and services (annual % growth) - Gross fixed capital formation - PRGDP one period lag - Time/ trend variable	World bank (WDI) and Int'l Telecom Union (ITU) database and other related local sources	▪ Descriptive statistics ▪ Regression Analysis	$PRGDP_t$ = F(TInv, LF, FDI, T ,X, GFCF) $PRGDP_t = \gamma_0 + \gamma_1 TInv_t + \gamma_2 LF_t + \gamma_3 PRGDP_{t-1} + \gamma_4 FDI_t + \gamma_5 GFCF + \gamma_6 X_t + \gamma_7 T + \epsilon_t$ Where: PRGDP = Per Capita real GDP TInv = Telecom investment FDI= Foreign Direct invest per year LF = total labor force $PRGDP_{t-1}$= Lagged value of per capita real GDP T= Time (telecom deregulation dummy) X= Export of goods and services (annual % growth) GFCF = Gross fixed capital formation ϵ= error term	H_o = Telecom reforms will not promote economic growth $\gamma_1 = 0$ $\gamma_7 = 0$ H_1 = telecom reforms will promote economic growth $\gamma_1 \neq 0$ $\gamma_7 \neq 0$

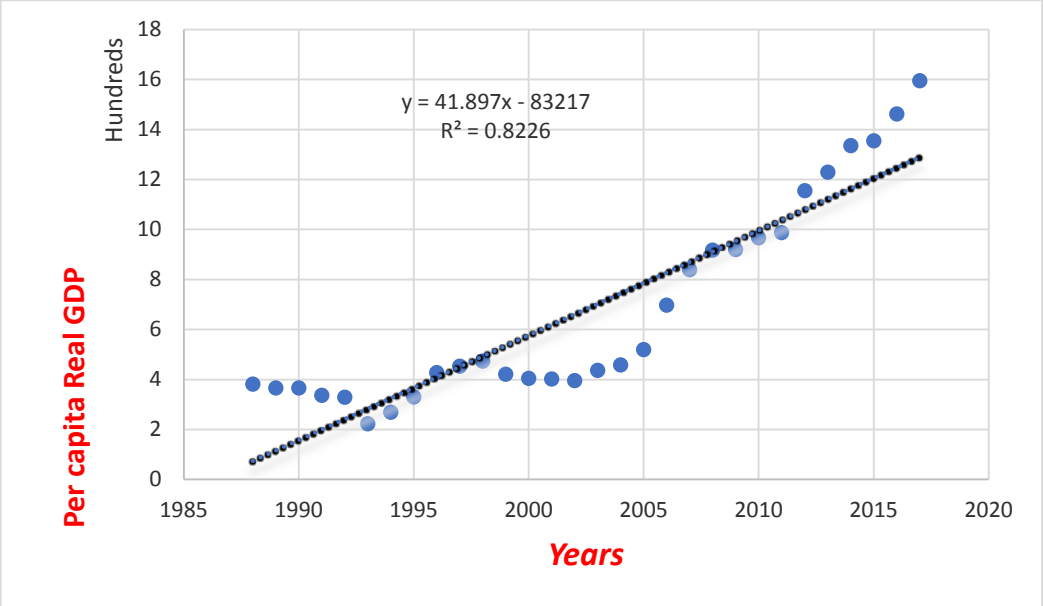
CHAPTER FOUR

4. Findings and discussions

4.1. Descriptive statistics

4.1.1. Trends of per capita real GDP of Kenya

As shown in Figure: 3 per capital real GDP has been increasing over the years 1988-2017. The rate of increase is higher following the telecom reforms in year 1999 and possibly the corresponding increases in private investment, FDI inflows and Gross Fixed capital Formation and other contributing factors.

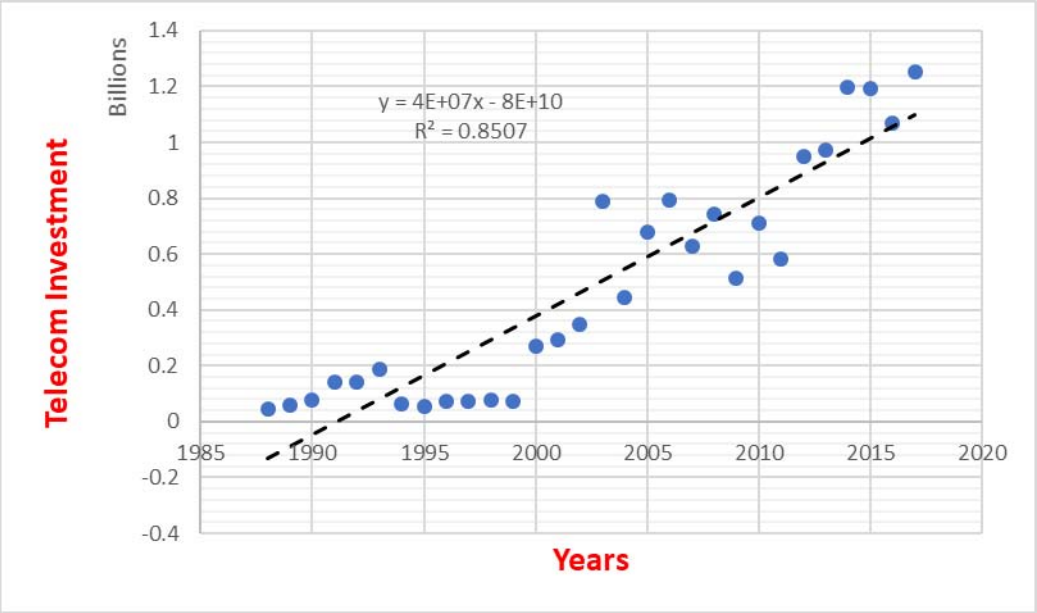


Source: Based on World Bank database from 1988-2017

Figure 3: Trend in Kenyan real per capita GDP period 1988-2017

4.1.2. Trends of Telecom investment

Figure: 4 shows an increasing trend of telecom investment for the year 1988-2017 potentially due to Kenya's opening the sector to foreign and local investors. Telecom investment shows negative and growing slowly in the early years, due to monopoly and there was lack of private sector participation. After year 2004 investment has been growing.



Source: Based on World Bank data from 1988-2017

Figure: 4: Trends in Kenyan Telecom investment from year 1988-2017

4.2. Results of Statistical Tests

4.2.1. Unit Root Test

The study conducted a test for stationarity using Augmented Dickey Fuller Test (ADF). Therefore, the study estimated three models, with intercept, with a trend and an intercept, and with a trend but without an intercept. Table 4 illustrated that all variables are stationary at first difference I(1).

Table: 4 Unit root test for stationarity using Augmented Dickey Fuller test (ADF) test

Variables	ADF T-Statistic	Critical values (1%,5%,10%)			p-value	Status of Unit root
LogPRGDP	-7.675571	-3.699871	-3.711457	-3.699871	0.0000	I(1)
LogFDI	-5.837545	-4.309824	-3.711457	-4.309824	0.0002	I(1)
LogLF	-4.993434	-4.309824	-3.711457	-2.627420	0.0004	I(1)
LogGFCF	-4.298586	-3.699871	-3.711457	-3.689194	0.0000	I(1)
LogX	-7.313200	-3.699871	-3.711457	-3.699871	0.0000	I(1)
LogTInv	-6.43291	-3.689194	-3.711457	-3.689194	0.0000	I(1)
logPRGDP lagged (-1)	-7.512346	-3.711457	-3.711457	-2.629906	0.0000	I(1)

4.2.2. Autocorrelation test

Serial correlation (Autocorrelation) is where the error terms in a time series transfers from one period to another, that means, the error for one time period is t_1 is correlated with the error for a subsequent time period t_2. The underestimation of one-year value can result in an underestimate of value in the next subsequent periods. If autocorrelation exists, the OLS estimators are still unbiased and consistent, and the error terms can still normally distributed, but they will not be efficient or BLUE (Best Linear Unbiased estimates), (Gujarati, 2004).

Therefore, the study conducted the test for autocorrelation in the residuals using Breusch-Godfree (BG) test with the null hypothesis is that, residuals are not serially correlated, and the alternative hypothesis is the residual are serially correlated. If the observed R^2 and the corresponding p-value is less than 5%, the residual are serially correlated, if not, the residuals are not serially correlated, it means we accept the null hypothesis. The autocorrelation output shows that the observed R^2 is 36.99%% which is greater than 5%, that means it is not significant. Therefore, we accept the null hypothesis that there is no serial correlation in the residual.

4.2.3. Heteroscedasticity test

The study also conducted test for heteroscedasticity of the residuals. One of the assumptions of the CLRM is that the variance in the error term is constant or homoscedastic. If heteroscedasticity exists, the results will be less efficient and makes the statistical inferences less reliable. If the size of the error term differs across values of the independent variable, or the variance of the residuals are not constant, the series encountered heteroscedasticity (Gujarati, 2004).

Heteroscedasticity test was conducted using Breusch-Pagan-Godfrey with the null hypothesis is that the residuals are not heteroscedastic, that is, it is homoscedastic, and the alternative

hypothesis is the residuals are heteroscedastic. If the observed R^2 is less than 5%, the residuals are heteroscedastic, or if the value of the observed R^2 is more than 5%, the residuals are not heteroscedastic, rather it is homoscedastic, (Gujarati, 2004).

The test results show that the residual are not heteroscedastic, meaning, the observed R^2 results is estimated at 10.24% which is greater than 5%. This implies, that we cannot reject the null hypothesis rather we accept the null hypothesis the residual are not heteroscedastic.

4.2.4. Multicollinearity test

One of the assumptions of the classical linear regression model (CLRM) is that there is no exact linear relationship among the regressors, (Gujarati, 2004). If there is one or more such relationship among the regressors, multicollinearity problem is said to exist. If the relationship is perfect or exact linear relationship among the explanatory variables, the regression coefficient of the variables becomes indeterminate and their standard error are infinite. In case of time series data, the regressors included in the model will share a common trend, that is, they may all increase or decrease over time (Gujarati, 2004).

To detect the existence of multicollinearity, the study used Variance Inflation Factor (VIF) test using EViews software, to check if the independent variables are highly correlated or not. To determine the multicollinearity in the independent variables. Thus, the VIF values of all variables are <10 which indicates there is no multicollinearity problem between independent variables.

Co-integration Test

Tests for cointegration identify stable, long-run relationships between sets of variables. The study conducted cointegration teste to analyze if there is a long run association between variables using Johannsen Cointegration test. The null hypothesis is that variables are not cointegrated, therefore, the test for cointegration is applied using EViews software, and the resulted indicated that there is long-run relationship exists between all the variables at 5% significance level, so we can reject the null hypothesis.

Vector Error Correction (VEC)

According to the cointegration test, all the variables are cointegrated or has long run association. Therefore, the next step is to perform Vector Error Correction to identify the short run and long run causality between variables. The cointegrating term is known as the error correction term since the deviation from the long run equilibrium is corrected gradually through a series of partial short run adjustments. Therefore, the study conducted VECM using Eviews, to capture the short run and long run effects of the variables. To check the short run causality, the study used Wald Test and it is revealed that there is no short run causality between variables but there is a long run causality exists between all variables.

4.3. Shift in the Kenyan Growth Structure

4.3.1. Test for structural Break

The presence of structural change in the dependent variable determines the specification of the estimated regression model. The study hypothesized that there is a structural change due to the deregulation of the telecom sector in Kenya. This implies that the values of the parameters of the model do not remain the same through the entire sample period (Gujarati, 2004). To find out if structural break has occurred the study conducted Chow Test, which it is hypothesized that there is a structural break due to a policy change in Kenya and that may disturb the relationship between real per capita GDP and telecom investment.

$$PRGDP_t = \alpha_1 + \alpha_2 TInv_t + \alpha_3 LF_t + \alpha_4 PRGDPt_{-1} + \alpha_5 FDI_t + \alpha_6 GFCF + \alpha_7 \boldsymbol{X}_t + \mathcal{E}_{1_t} \quad (1.1)$$

$$PRGDP_t = \alpha_1 + \delta_1 TInv_t + \delta_2 LF_t + \delta_3 PRGDPt_{-1+} \delta_4 FDI_t + \delta_5 GFCF + \delta_6 \boldsymbol{X}_t + \mathcal{E}_{2_t} \quad (1.2)$$

$$PRGDP_t = \beta_1 + \beta_2 TInv_t + \beta_3 FDI_t + \beta_4 LF_t + \beta_5 GFCF + \beta_6 \boldsymbol{X}_t + \beta_7 PRGDPt_{-1} + \beta_8 T + \mathcal{E}_{1_t} \quad (1.3.)$$

For time period (1988 - 2017) $n_1 = 16$

For time period (2004 - 2017) $n_2 = 14$

For time period (1988 - 2017) $n = n_1 + n_2 = 30$

Table: 5 Results of test for Structural Break

Variables	Break year	F-Statistics	p-Value
logTinv	1999	3.790799	0.0246**
logFDI	2000	4.288123	0.0150**
LogGFCF	2001	4.288123	0.0048**
logX	2002	4.257200	0.0085**
logLF	2003	3.868215	0.0129**
Log GDP lagged (-1)	2004	12.57718	0.0000*
	2005	0.663552	0.6801
	2006	0.811928	0.5757
	2007	0.390332	0.8751
	2007	0.195911	0.9736
	2009	0.176088	0.5757
	2010	0.135992	0.9895
	2011	0.150901	0.9863
	2012	0.158564	0.9844
	2013	0.135689	0.9657

Significance level *p<0.01; **p<0.05;

The above test for structural break, illustrated that there was more than one structural break dates, at year 1999, 2000,2001 and 2002 at 5% significance level. However, in year 2004, there was a significant shift in real GDP per capita at 1% significance level. This indicates that, the actual structural break date for the variables was found to be 2004, which is five years after the reform period. It implies that, although, the reform was made in 1999 it took 5 years to bring a significant effect on real GDP per capita.

Table: 6 Regression results from 1988-2003 (Pre-reform period)

Variables	F-Statistics	P-value
logTinv	0.081951	0.9789
logFDI	0.000942	0.9760
logLF	3.354880	0.0842
logGFCF	42.04068	0.0014**
logX	3.287134	0.0913
logPRGDP(-1)	12.89250	0.0039**

Significance level *p<0.01; **p<0.05;

T**able: 7 Regression results from 2004-2017 (Post-reform period)**

Variables	F-Statistics	P-value
logTinv	10.09176	0.0080**
logFDI	36.65136	0.0000*
logLF	194.9566	0.0002**
logGFCF	124.4269	0.0000*
logX	13.18827	0.0034**
logPRGDP(-1)	264.6114	0.0000*

Significance level *p<0.01; **p<0.05;

The test for structural break divides the sample into two periods, the first regression model assumes there is no difference between the two periods, and therefore, estimates the relationship between real per capita GDP and telecom investment for the entire period consisting 30 observations. In other words, this regression assumes that the intercepts as well as the slop coefficients remains the same for the entire period. Therefore, the regression equation is fitted, using equation (1.3), to the combined sets of observation and select the residual sum-of-squares and next a regression equation is fitted, using equation (1.1) and (1.2) for separate sets of samples and collect residual sum-of-squares with the assumption that the two sets are not equal.

The F-test is used to decide whether one regression line is efficient to explain the data, or two separate regression line using two sub-samples. The F-test is calculated using the following formula:-

$$F = \frac{RSS_w - (RSS_1 + RSS_2)/k}{(RSS_1 + RSS_2)/(n_1 + n_2 - 2k)}$$

Where: RSS_w is Residual Sum of Square for the whole sample

RSS_1 is Residual Sum of Square for period 1 k = number of parameters to be estimate which is 2

RSS_2 is Residual Sum of Square for period 2 n = number of observations

Based on the above regression results, the F-test is calculated as:-

$$F = \frac{RSS_w - (RSS_1 + RSS_2)/k}{(RSS_1 + RSS_2)/(n_1 + n_2 - 2k)}$$

= 12.61

After running the F-test, for the presence of structural break; the results of the F-test clearly show that the null hypothesis of no structural break is rejected. The empirical results based on the model indicted that there was a structural break which provided adequate evidence to reject the null hypothesis of no structural break of the variables under investigation.

Based on Figure: 5, we suspect the presence of structural break at year 2004. Thus, a test is conducted, as illustrated in table 5 and the results of the test also illustrated in the below tables.

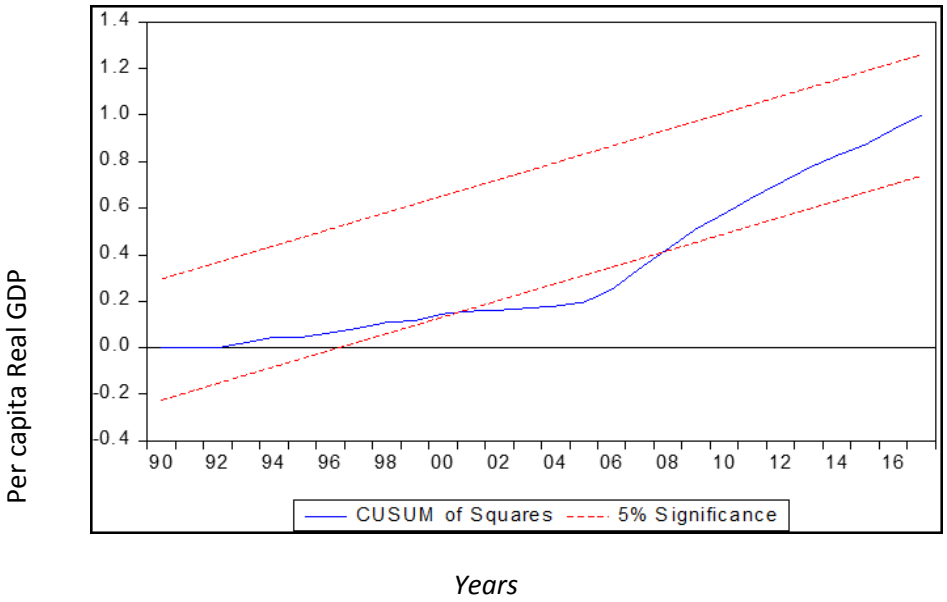


Figure 5: Graphical presentation of structural break between from 1988-2017 using "EViews"

The structural break occurred in 2004 which is four years after telecom reform, that was in 1999, which indicated that the actual implementation and private investors enter the country to invest in the sector and the implication of their contribution to the real per capita GDP took four years. The shift in growth of Kenyan economy in year 2004 was due to a combination of other factors besides telecom policy change and its spillover effect on other sectors.

The Chow Test requires that the assumption of normality of residuals not violated. Thus, the study the residuals using Jarque Bera test for normality for the two subperiods, independently, with the null hypothesis is that, the error terms of the two variables follow normal distribution and, the alternative hypothesis is, the error term of the variables does not follow normal distribution (Gujarati, 2004). The results of the test indicated that the residuals of the two variables are normally distributed with the probability 9.37 and 29.44 respectively which is

higher than the probability of 0.05. Therefore, the null hypothesis of normality could not be rejected.

4.4. Effect of telecom deregulation on real per capita GDP growth in Kenya

The Chow Test results indicated the existence of structural change, associated with telecom reform in year 2004. However, in order to see whether this result holds when other variables affecting real per capita GDP are included, a linear regression is fitted. In order to examine the effect of the reform on real per capita GDP, after other variables are included like Labor force, FDI, Gros Fixed Capital Formation (GFCF), level of Export (X) and Telecom investment (Tinv) and lagged value of per capita real GDP were fitted.

Given that test results proved the existence of structural break in 2004, the study introduced a time variable, *t*, to control for the structural break. Moreover, including the time variable is useful to express variables which are difficult to measure, for instance, to feel the impact technological changes, we may use time or trend variable (Gujarati, 2004), and to capture the effect of policy changes. Another reason for using time variable is to avoid spurious correlation which implies that one or two variables may not be causally related, but we may obtain high R^2 or high correlation (Gujarati, 2004). For this study we use time dummy to control for structural break which test results proved to occur during 2004.

Table 8: Regression results for effect of telecom reform on per capita GDP

Variables	Estimated parameters	P-value
Intercept	-8.25	0.0011
logRPGDP(-1) lagged	0.25	0.1347
LogFDI	0.46	0.0000*
logGFCF	0.25	0.0184**
LogLF	0.19	0.1358
LogTinv	0.45	0.0018**
LogX	-0.08	0.4691
T(Before reform=0 and After the reform = 1)	0.60	0.0040**

Source: author's calculation based on World Bank database: 30years of observation; R^2: = 0.9887; Adjusted R^2:= 0.9850; Prob(F-statistic 0.0000*); F(7,26) =263.967; *p<0.01, **p<0.05, ***p<0.1

Regression results show that telecom investment (Tinv) and Gross Fixed Capital Formation (GFCF), are positive and statistically significant, the level of FDI flows and total Labor Force are positive but statistically not significant, Total Export of goods and services shows negative and statistically not significant implying that total labor force has an adverse effect on Kenyan per capita GDP growth over the period 2004-2017. In addition, the previous year per capita GDP or the lagged value shows positive and statistically significant, it implies that, the previous year per capita GDP has an influence on the current year. Telecom liberalization policy and all other structural changes as measured by time variable t as an indicator, is denoted by (T) and it captures the time before and after the policy change and T=0 signifies time before the reform and T=1 is period after the reform. As the result indicates, telecom reform is positive and statistically significant in addition the F-statistics of the probability value is also significant, implying that all the independent variables jointly can influence the dependent variable, real per capita GDP as compared to a model with only an intercept. R^2 measures the appropriateness of the model and the value 0.98% implies the explanatory variables explain more than 50% of the variation in the real per capita GDP.

In general, the variable of interest in the study were Telecom investment and telecom liberalization (time variable), both variables show positive and statistically significant results. Therefore, it rejects the null hypothesis that telecom reform will not promote economic growth and accepts the alternative hypothesis that telecom reform contributes to economic growth of Kenya and the effect is found to be long run.

CHAPTER FIVE

5.1. Conclusions

This study has investigated the effect of telecom sector reforms on economic growth of Kenya using a time series data from 1988 to 2017. It analyzes if and when structural break occurred in per capita GDP and telecom investment using a Chow Test. Moreover, least square methods of estimation were used to analyze the effect of telecom sector liberalization on economic growth of Kenya using regression analysis.

The findings of the study indicated that there was a structural break in per capita real GDP in year 2004, five years after the telecom deregulation occurred in 1999. In addition, the telecom reform made during that period also increases the level of telecom investment, FDI inflows from private telecom investors. The Gross fixed capital formation has increased significantly due to the network and infrastructural building through involving private investors in the sector.

The result of the estimated regression indicated that telecom liberalization found to be positive and statistically significant in explaining per capital GDP of Kenya. Telecom investment, Gross Fixed Capital Formation also found positive and statistically significant influence over real per capita GDP, as private investors participated in the network infrastructural building. In addition, the previous year GDP per capita also show significant effect on the current GDP. In general, telecom reform has created a shift in growth structure of Kenyan economy and also promotes economic growth of Kenya, therefore, it can be concluded that, the study failed to reject the null hypothesis that ‘no structural break’, in addition, it also accepts the hypothesis is that telecom liberalization promotes economic growth of Kenya.

5.2. Recommendations

Based on the finding of the study, the following policy recommendations are made:-

The study found that, telecom investment, gross fixed capital formation and telecom reform is found to be positive and significantly contributes to per capita GDP growth of Kenya. This indicated that a macro policy reform can significantly affect the economic performance of Kenya. This suggests that Kenya should invite more telecom operators, local and international to the sector since Kenya is still under partial liberalization.

In addition, Kenya should focus on promoting facility-based competition, because when private investors are entering to the host country in a facility-based form, they will build their own telecom infrastructure and it will have a long run positive impact for Kenyan economy. Whereas, in service- based form, the country may befit from short run price reduction.

Partial liberalization has brought significant contribution to economic growth of Kenya, and it is expected that full competition/liberalization would bring much greater impact on per capita GDP Growth of Kenya. The export sector on the other hand has shown an adverse impact to per capita GDP, so the government of Kenya should give special emphasis to the sector.

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Annexes

2.2.5. Status of telecom reform in Africa

Countries	Local	Long distance	International	Mobile	Internet	Year of creation of regulatory authority	Independence of regulatory authority
Angola	Full competition	Full competition	Full competition	Partial competition	Full competition	1999	No
Burundi	Full competition	Full competition	Full competition	Full competition	Full competition	1997	No
Ruanda	Full competition	Full competition	Full competition	Full competition	Full competition	2001	Yes
Congo	Full competition	Full competition	Partial competition	Full competition	Full competition	-	-
Mauritius	Full competition	Full competition	Full competition	Full competition	Full competition	2002	Yes
Senegal	Full competition	Full competition	Full competition	Full competition	Full competition	-	-
Seychelles	Partial competition	Partial competition	Partial competition	Partial competition	Partial competition	-	-
Côte d'Ivoire	Partial competition	Partial competition	Partial competition	Partial competition	Full competition	1995	yes
Liberia	Partial competition	Partial competition	Full competition	Full competition	Full competition	-	-
South Africa	Full competition	Full competition	Full competition	Partial competition	Full competition	2000	No
Mali	Partial competition	Partial competition	Partial competition	Partial competition	Full competition	1999	Yes
Kenya	Partial competition	Partial competition	Partial competition	Partial competition	Full competition	1999	Yes
Chad	Partial competition	Partial competition	Partial competition	Partial competition	Full competition	1998	Yes
Guinee	Partial competition	Partial competition	Partial competition	Partial competition	Full competition	1992	No
Nigeria	Full competition	Partial competition	Partial competition	Partial competition	Full competition	1992	Yes
Zimbabwe	Full competition	Partial competition	Partial competition	Full competition	Full competition	2000	Yes
Lesotho	Partial competition	Partial competition	Partial competition	Full competition	Full competition	2000	Yes

Ethiopia	Monopoly	Monopoly	Monopoly	Monopoly	Monopoly	1996	Yes
Eritrea	Monopoly	Monopoly	Monopoly	Full competition	Full competition	1998	Yes
Tanzania	Monopoly	Monopoly	Monopoly	Full competition	Full competition	1994	Yes
Cape Verde	Monopoly	Monopoly	Monopoly	Full competition	Full competition	2004	Yes
Gambia	Monopoly	Monopoly	Monopoly	Partial competition	Partial competition	2004	Yes
Namibia	Monopoly	Monopoly	Monopoly	Monopoly	Full competition	1992	Yes
Niger	Monopoly	Monopoly	Monopoly	Full competition	Monopoly	-	-
Zambia	Monopoly	Monopoly	Monopoly	Partial competition	Partial competition	1994	No

Source: WTO, Economic Research and Statistics Division

Table 1: Telecom reform status of African countries

DECLARATION

I, the undersigned, hereby declare that a thesis entitled, "*The effect of Telecom Sector Liberalization on Economic Growth of Kenya"* submitted by me for the award of MSc. in African Studies (Human and Economic Development in Africa). This is my original work and it had not been presented for a degree in any other universities.

Declared by:-

Name: Mekdes Lebenie Enkurie

Signature: _____

Date:_____

Confirmed by Advisor:

Name: Kidist Gebreselasie (PhD)

Signature: _____

Date:_____