Institutions, Telecommunications and Economic Performance in Nigeria

Umar Salisu[1]
umars7781@gmail.com

Emmanuel Yahaya Ibrahim[2]
yamanuelec@yahoo.com

ABSTRACT

One of the views that is fast and widespread across countries is the view that telecommunications plays a pivotal role in economic development. This has led to massive reformation of institutions in the sector. The reformation of the institutions is contingent on the theoretical underpinnings that good institutions enhance the efficiency of the telecommunications sector. This in turn, directly and through other sectors improves economic performance. This paper sets out to examine the separate effects of the reform and the reformed telecommunications on the various measures of economic performance. We estimated the Modified Engle-Granger cointegration test that allows for structural break using Nigeria's data for the period 1984-2011. A step dummy variable is used to measure the effects of the reform on the various indicators of economic performance, while a slope dummy is used to measure the effects of the reformed telecommunications sector on economic performance. The results of this model show that the reform and the reformed telecommunications have significant effects on economic performance. Their effects on growth are found to be statistically significant both in the short-run and in the long-run. The effects, however, on unemployment and Poverty are found to be significant only in the long-run. In addition, we found the effects of the reform to be the most important. This, we recommend that the regulatory body should concentrate more effort in designing and improving good institutions that will enable the maximum benefits from telecommunications to be derived.

Keywords: Institutions, Telecommunications, Economic Performance and MEG

JEL Classification Codes: E02, O43, O11

1.0 Introduction

It is widely accepted that telecommunications sector remains one of the strategic sectors that aids the realization of the macroeconomic objectives of economic growth and development in most countries. As a result of this received wisdom, a number of countries especially in Africa, over the last two decades have carried out institutional and regulatory reforms in their telecommunications sectors. The general argument underlying these reforms lies on the fact that efficient institutions in the telecommunications sector spurs growth of the sector and as well generate externalities that trigger growth in other sectors of the economy. This should in turn propel economic performance (African Partnership Forum, 2008). The theoretical argument in the neoclassical literature is that the investment flows lead directly to economic performance. Therefore, a direct link should exist between telecommunications investment and economic performance. In the case of the developing nations, an enhanced telecommunications sector is not only necessary for growth but is also a precondition for effective participation in the highly competitive world markets and for attracting new investors (Jacobson, 2003).

Following the growing concern for Nigeria to develop and to be abreast with international best practices, the telecommunications industry witnessed another reform in 2000. This allows for private sector participation in the industry and also incorporated institutional and regulatory reforms. Following these reforms, the sector appears to have experienced an impressive growth. This is because, for instance, its contribution to GDP had surged from 0.62% in 2001 when these reforms started for just one year, to about 8.53% in 2013 March. Teledensity, which indicates both access to, and size of, telecommunications services, rose from 0.73% in 2001 to 68.68% in 2012. The installed capacity also experienced an unprecedented increase and the various tariffs declined drastically by over 65% (www.ncc.gov.ng). One important question is whether the growth in this sector had spurred better economic performance. In other words, to what extent had the massive growth in the telecommunications sector led to growth in national output, reduction in unemployment and poverty? However, a casual view on the Nigeria's data regarding telecommunications sector development, output level, unemployment and poverty may prompt one to believe in an inverse relationship between telecommunications development and economic performance as opposed to the neoclassical tenets.

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[1] Assistant Lecturer, Department of Economics, Kaduna State University, Kaduna, Nigeria and [2]Graduate student, Department of Economics, Ahmadu Bello University, Zaria, Nigeria.

Considerable efforts have been made to empirically establish the nature of correlation between telecommunications investment and economic performance. The findings from most of these studies suggest a positive relationship. However, a number of these works just used a single measure of economic performance. That is, increase in Gross Domestic Product (GDP). Therefore, our study would attempt to extent the existing evidences by considering economic performance from a broader perspective (i.e. increase in output level, reduction in unemployment and poverty) and by employing an alternative estimation technique. Specifically, this study seeks to uncover the separate effects of the reform as well as the effects of the sector on the various indicators of economic performance. In order to achieve the main aim of this paper, we employ the Modified Engle-Granger Cointegration test that allows for structural break. The findings from this study will not only be relevant to the Nigerian communications commission (NCC) but will also have spillover benefits to other utilities' regulatory bodies.

The remainder of this paper is structured as follows. Section two presents the literature review and the overview of telecommunications' performance in Nigeria. Section three is the methodology of the study. Section four presents and discusses the results while section five concludes and draws policy implications.

2.0 Literature Review
2.1.0 Theoretical Literature
2.1.1 The Link between Institutions and Telecommunications
The development of basic telecommunications infrastructure alongside other utilities as electricity has traditionally been argued to depend on the quality of countries' institutions in general and on their political institutions in particular. This could be as a result of the fact that the existence of political checks and balances reduces the chances of expropriation of the investment by the government (Andonova and Diaz-Serrano, 2007). The idea that the telecommunications sector is a natural monopoly has been disputed, just as government ownership and operation is no longer considered as prerequisite for strong sectoral performance. It is now believed that certain institutions and policies can enhance the performance of Country's telecommunications sector. That is sectoral performance is attributed to a mixture of factors as regulatory governance and incentives, competition, ownership, and political stability. A number of African's nations (Nigeria inclusive) have embarked upon a reform in their telecommunications sector especially in recent years. This includes the privatization, deregulation and liberalization of basic telecommunications service, the establishment of autonomous regulatory institutions, as well as the introduction of competition in some selected services (Berg and Hamilton, 2001). Berg and Hamilton went further to state that the realization of telecommunications development in Africa, as found in developed countries depends on the willingness and ability of governments to establish regulatory and legislative institutions that promote development of telecommunications infrastructure and service offerings. Governments are now of the view that infrastructural management and investment by private firms can be beneficial in say two ways. That is, in terms of enhanced efficiency in the sector and also with regards to generating externalities that triggers additional private investments in other sectors of the economy. In essence, Telecommunications sector has been regarded as one with multiplier effect on almost all other sectors of the economy.

Also, Economics tradition has viewed investment generally as an integral factor that influences growth process. That savings and investment must go hand in hand for sustained economic growth. Recent researches argued that economic policy dependent on classic arguments on economic development are not longer enough unless formulated alongside legal, institutional and regulatory reforms. Therefore, the quality of a country's legal regimes, its business regulations and its institutions has now been established to be a principal determinant of its economic performance. In fact, it has been claimed that institutions are key and where legal regimes are weak, transactions costs of business rises (Wilson, 2005). Furthermore, Economic development has been conceived as a multidimensional process that involves the reorganization and reorientation of the entire economic and social systems. Therefore, income and output growth should typically involve transformation in institutional, social and administrative structures and even in popular attitudes, customs and beliefs as well (Todaro and Smith, 2011). In essence, Institutional and regulatory reforms need to be incorporated into the reform process in order to achieve the expected growth in the sector and as well an enhanced level of economic performance in the economy. As argued in Lehr and Glassman (2001), there exists ample evidence that regulatory liberalization and increased competition encourage more rapid telecommunications infrastructure modernization. Their argument is that if effective competition can be established, then market forces can substitute for direct regulatory oversight to discipline industry behaviour. The benefit of Competition is that it facilitates innovation which serves as an impetus for continued growth and still larger benefits in the future. It is expected that competition will lower prices, leading to increase in demand. This will in turn induce additional investments in aggregate industry capacity. Also, Competition provides incentives to innovate as firms seek to lower costs and to differentiate their

products in order to improve margins. It therefore, encourages faster network modernization. Liberalization and increased telecommunications competition can exert a positive impact on the sector itself and in the overall economy.

Summarily, the outcome of deregulation of the telecommunications sector in advanced countries and the pursuit for economic growth had enabled a number of African Countries from the last two decades, to provide legislative and regulatory developments in their telecommunications sector. This has the potential for development of the sector and other sectors in the various economies. For instance, the recent reform in the Nigerian telecommunications sector which involves privatization, deregulation and liberalization had attracted large infrastructural investment within and outside the Country. This has injected competition in the sector; attract more investments and employment opportunities in the Country and better education and training facilities as well (Olumide, 2011). Therefore, institutions lead to the development of the telecommunications sector.

2.1.2 The Link between Telecommunications and Economic Performance

The role of telecommunications infrastructure in enhancing economic growth has in recent times been a subject for discourse in the economic literature. Some scholars argued that adequate telecommunications infrastructure is a prerequisite for the growth and development of a modern nation to its full potential. In other words, the development of telecommunications infrastructure has the potential to boost economic growth and development. Having known this, a number of advanced economies had deregulated their telecommunications sectors to call for more investments and the outcomes were: improved telecommunications capabilities; more foreign investment, boom in private sector development, more employment opportunities and better education and training facilities (Tella *et. al.,* 2007).

A good advantage of the service sector is that services are not the ends themselves but means to an end. They are vital inputs for the production and trade of most goods. Telecommunications sector as one of the services sector has been considered to be a development tool because of its broad range. By facilitating the dissemination of information and communication, it avails people the opportunity to participate more actively in the social, economic and political life of a community. In a more mundane level, telecommunications exert direct effects on productivity growth; it increases the efficiency of service providers and provides new markets by reducing distances. It is a growing sector that creates new activity in itself; contribute to economic growth and employment generation. It beneficial effect on other sectors is also substantial. The contribution of the Telecommunications sector to growth comes from the private return to capital and from the output generated via externalities (Jacobsen, 2003). Therefore, a positive link exists between development of telecommunications infrastructures and economic growth due to network externalities.

Also, some authors claimed that the telecommunications industry contribute significantly to economic growth. The greater part of this contribution comes from infrastructure investments in the sector. Economic theory however, claims that these investments can lead to economic growth in several ways. Naturally, these investments, while expanding the telecommunications networks, can increase the availability of telecommunications products and motivate higher demand. Also, in the view of network economics literature, these investments, while motivating higher demand, can amplify the network externalities. This can therefore increase the efficiency of firms in the economy and lead to economic growth (Jerbashian, 2011).

2.1.3 Neoclassical Growth Theory/New Institutional Economics

The Neoclassicists consider the problem of underdevelopment in third world Countries as internally induced phenomenon caused mainly by excessive government intervention and poor economic policies. The Traditional neoclassical free market argument asserted that opening up (liberalization) of national markets call for additional domestic and foreign investment and therefore increases the rate of capital accumulation. In terms of GDP growth, this is equivalent to raising domestic savings rates, which enhances capital-labour ratios and per capita incomes in capital-poor developing countries (Todaro and Smith, 2011). The neo-liberal economics views on development disregard the role of the state and advocate liberalization in both local and international markets, thereby marginalizing the role of the state to an extent. An intermediate view was proposed by the New Institutional Economics. This view the state and the institutions that comprise it as endogenous to the development process and view the design and functioning of public sector institutions and private sector organizations that interact with these institutions as critical determinants of country's development prospects (Khalil *et.al.,* 2007). Following work of North (1990), there is an increasing consensus among economics that institutions partially determine long run economic performance. Recently, numerous studies in institutional economics have highlighted the importance of institutions for growth and economic development. The success of

economics in achieving high levels of economic growth requires a suitable legal and economic environment, as well as the reform of the rules and institutions that govern the strategic interaction of the participants in the political game (Ngendakuriyo, 2009). To North and other Institutional economists as Rodrik, Acemoglu, Johnson and Robinson, the existence of an implicit incentive structure drives both traditional growth models and the new models built around increasing return. In essence, the institutional infrastructure and the standard constraints of economic theory determine productive opportunities and economic performance. A number of recent studies provide an acknowledgement and theoretical development of the central role of institutions in economic development (Jellema and Roland, 2010). Also, North said that, the inability of societies to develop effective low-cost enforcement of contracts is largely attributed to both historical stagnation and contemporary underdevelopment in the Third World Countries. This is because the absence of secure property and contractual rights discourages investment and specialization.

2.2.0 Empirical Literature

A vast empirical literature exists on the linkage between telecommunications and economic growth. Most of these studies are conducted in advanced societies; in developing countries, however, the empirical literature is fast growing especially in Nigeria following the recent telecommunications reform which commenced in the early years of last decade.

A greater number of these studies document a positive relationship between telecommunications development and economic performance. They argued that investment in telecommunications infrastructure impact positively on economic growth and development.

2.2.1 Foreign Based Evidences

There are large number of early and recent foreign based empirical studies on the relationship between telecommunications and economic growth especially in advanced nation. These include: [Jipp (1963), Bee and Gilling (1967), Aschauer (1989), DeLong and Summers (1991), Norton (1992), Canning *et. al.* (1994) Greestein and Spiller (1995), Nadiri and Nandi (1997), Madden and Savage (1998), Wallsten (1999), Wang (1999), Rodrígues and Wilson (2000), Boylaud and Nicoletti (2001), Yilmaz *et. al.* (2001), Fink *et. al.* (2002), Li and Lyons (2008), Cui *et. al.* (2009). For more on some of these studies see Osotimehin *et. al.* (2010) and Olumide (2011)].

Norton (1992) using the average telephone stock between 1957 and 1977 as a variable for telecommunications, he estimated the effect of telecommunication on the average growth rate for 47 countries. He found a positive and significant relationship between the telecommunications and economic performance. Wallsten (1999) examines the effects of privatization, competition, and regulation on telecommunications performance in 30 African and Latin American countries from 1984 to 1997. Using fixed-effects regressions, the study finds that competition is correlated with increases in the per capita number of mainlines, payphones, and connection capacity, and with decreases in the price of local calls. Privatization was found to be negatively correlated with mainline penetration and connection capacity. However, Privatization combined with an independent regulator, was found to be positively correlated with connection capacity and substantially mitigates the negative effect on mainline penetration. This stresses the importance of regulation in reforms. Rodrígues and Wilson (2000) examined the relationship between information technology and economic growth. They perform a cross-sectional analysis for 110 countries, with economic growth rates between 1988 and 1997 as dependent variable. They do not succeed in establishing a causal link between technology and economic growth. Cui *et. al.* (2009), examined the relationship between reform and the performances of China telecommunications sector over the period 1975 – 2006. They used multiple linear regression analysis and found that privatization and competition significantly improve the output, efficiency and investment. They however do not have significant impact on the employment in the sector.

2.2.2 Evidences on Nigeria

The pioneering empirical work on telecommunications infrastructure and economic growth in Nigeria is that of Tella *et. al.* (2007). Using a system of simultaneous equation model for the time span 1993-2004; they found after controlling for capital, a positive and significant effects of telecommunications infrastructure on economic growth. This finding generated other empirical works with different models; the findings from most of these studies however agree with Tella *et. al.* (2007). For instance, Osotimehin *et. al.* (2010), carry out an appraisal of the effects of investments in telecommunications infrastructure on economic growth in Nigeria measured by gross domestic product. Using a comprehensive national level data set for a sample period of 16 years (1992-2007) and by employing the pooled ordinary least squared (OLS) regression methods, their results show that telecommunications infrastructure is both statistically significant and positively correlated with economic

growth. Olalekan (2012) examines the relationship between real investment in telecommunications and economic growth in Nigeria. He used time series data from 1980 – 2010 and granger causality test to determine the direction of causality between real investment in telecommunications and economic growth. The result shows a unidirectional relationship running from real investment in telecommunications to economic growth, i.e. real investment in telecommunications granger cause economic growth while economic growth do not. Awoleye *et. al.* (2012) carry out a study to explore the effects of telecommunications in Nigeria on gross domestic product for a sample period of 11 years (1999-2009). Using ordinary least squares technique, their results suggest that telecommunications infrastructure measured by private investment in telecommunications is statistically significant and positively correlated with economic growth. However, it was found that telecommunication contribution to GDP has a negative relationship to the economic growth in Nigeria. Onakoya *et. al.* (2012) investigate the impact of investment in telecommunications infrastructure on economic growth in Nigeria. A multivariate model of simultaneous equations was used. By employing three-stage least squares method, their finding shows that telecommunications infrastructural investment has a significant impact on output of the economy directly through its industrial output and indirectly through the output of other sectors such as agriculture, manufacturing, oil and other services. The results also document a bi-directional causal relationship between telecommunications infrastructure and economic growth in Nigeria. Sanjo and Ololade (2013) examine the relationship between GSM usage and Business Activities in Nigeria. The study was conducted in Lagos and Ibadan cities. Using analysis of variance (ANOVA) and Pearson product correlation moment the results show that there is a positive and significant relationship between the use of GSM and trading activities in the study areas. Contrary to the findings of the above empirical works, Onakoya (2013) examines the causal relationships between investment in telecommunications and GDP during the transitional period between 1985 and 2003 alongside the impact of the reforms on the performance of the firms in the telecommunications sector. The finding suggests a strong and positive relationship between economic reform and firms' revenue and profit. The regression analysis reveals that the telecommunications sector is statistically insignificant in explaining the GDP. Also, the impact of investment in telecommunications was found to be an insignificant predictor of GDP and vice versa.

Only a handful of studies attempted to extend the effects of telecommunications to other measures of economic performance. Urama and Oduh (2012) conducted a study to ascertain the impact of developments in telecommunications on household Poverty level in Nigeria through its impact on household per capita income, small business turn over, employment and health. The study used cross-sectional data from a nationwide survey and employed the probit model as an estimation technique. The results suggest that developments in telecommunications have a positive and significant impact on poverty reduction in Nigeria. Bakare and Gold (2011) investigated the impact of Global System for Mobile Telecommunication (GSM) on the provision of employment opportunities; income and transaction cost of various economic activities of the masses. Primary data was collected and analyzed using linear regression analytical techniques. The result shows that GSM Communication has contributed positively to the economic situations of Nigeria and has served as source of income and employment to many Nigerian youths. Gold and Saibu (2012) examine the impacts of mobile telecommunication (GSM) on the development of Nigerian Economy in terms of employment and poverty reduction in some selected states in Southwest Nigeria. Primary data was collected and analyzed using linear regression analytical techniques. The study found that Investment in GSM exert positive and significant impacts on employment generation, household income and reduction in the level of poverty. This signifies that significant investment in GSM has impacted positively on the Nigerian economy using the Oyo, Osun and Ekiti states in the Southwest region of Nigeria. Gold *et. al.* (2012) examined both the impacts of mobile telecommunications on the Nigerian economy and the growth implication in terms of income generating capacities of households, provision of employment as regards to business expansion in three Nigerian south western states (Oyo, Osun and Ekiti). Primary data was collected and analyzed using the Ordinary Least Squares method (OLS). The findings suggest that GSM has enabled Nigerians to transact their businesses easily resulting in higher productivity; improved living standard; boosted economic capacity, and stimulate the economy to achieve the desired macroeconomic policy targets.

These studies are somehow not without limitations. We have reservation for Bakare and Gold (2011), Gold and Saibu (2012) and Gold *et. al.* (2012) models. Their models are basically the same but applied to different study areas. For this reason, the typical model for these studies is: *"TELEMPLjj = βoj + β1jNRSj + β2jHHAj + β3jNEMPLj + β4jEMPGSMj+ β5jCWELj+ β6jABIj + β7jEDUCj +β8GSMPOVSj+β9jCONTj + β10jDWLTHj + β11jSEXj + β12jSCAj+ ej"*. Where; TELEMPL, EMPGSM, and GSMPOVS represent GSM employment by respondent in 2012, Employed before GSM and GSM a poverty alleviation strategy respectively. From this model, for instance, a negative and significant β_8 means that there is an inverse relationship between GSM as poverty alleviation and GSM employment. That is, when ever GSM is used to alleviate poverty, employment

will fall. This is theoretically unacceptable, because as established in economics literature that when people are employed, they will not only earn income from it but that will also reduce the tendency to depend on others for means of livelihood. This will raise the overall welfare of the people.

Our study differs from other studies in the following ways. We introduce the dimension of institutions and use a different methodology. From the literature review, studies that attempted to investigate the effects of telecommunications on poverty and employment used a survey; this is however needful. In our study, we employ the use of secondary data and dummies to explore the relationships.

2.3 An Overview of the Nigerian Telecommunications' Performance

The Nigerian telecommunications services since its creation by Cables and Wires in 1886 had undergone series of reforms. Significant reforms can be traced back as far back as in 1962 when the Nigerian government acquired about 51% share of the Cables and Wires to form Nigerian External Telecommunications (NET). After 10 years of this partial acquisition, that is, in 1972, the government obtained the remaining 49% thereby gaining the overall control of the telecommunications. Resulting from this and as effort to strengthen and improve telecommunications in the country, the telecommunications arm of the Post and Telecommunications department was separated and amalgamated to form the Nigerian Telecommunications Limited (NITEL) in 1984.

The basic features that characterized the Nigerian telecommunications since 1960 and under the control of NITEL were inefficiency, poor services and unmet demand. For instance, 18,724 telephone lines serviced the estimated 45 million people; this means 1 telephone line to 2,000 people. Over time, the telephone lines improved from 1 telephone line to 440 and 250 people in 1985 and in 1991 respectively. This improvement however, was far below the standard of the International Telecommunications Union (ITU) of 1 telephone line to 100 people for a developing country. The establishment of Nigerian Communications Commission (NCC) in 1992 and the granting of licences to l37 private operators to engage in different telecommunications businesses did not still generate the expected benefits to be derived from telecommunications.

From the foregoing and underpinned by the growing consensus of growth potentials of the sector especially in the developing countries, the need to embark on a robust reform became indispensable. This informs the telecommunications reform of 2000. The thrust of the reform was to fully liberalize the market in order to increase competition and hence efficiency in the delivery of telecommunications services. But beyond this, the reform undertook to reposition the institutions in the sector. Institutions ranging from market creation, market regulations to market legitimization have been put in place. Specifically, this consists of regulations on approval, numbering, telecommunications networks interconnection, telecoms subscribers, frequency pricing, competition practices, universal access and universal service, consumer code of practice, enforcement processes and quality of service (www.ncc.gov.ng). This is line with the core argument of institutional economists that differences in outcomes among countries are largely due to differences in institutions (North, 1990; Davis, 2010). Following the reform, the industry's key statistics reveal that telecommunications has experienced an impressive growth. The investment in the sector which stood at $50 million in 1999 before the reform started rose to $18,000 million in 2009 (see Figure 1). The number of licensed fixed line and mobile operators increased from 17 and 4 in 2002 to 22 and 8 operators in 2009 respectively (Figure 2).
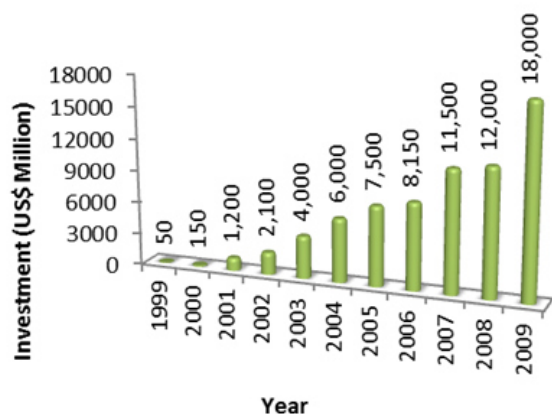

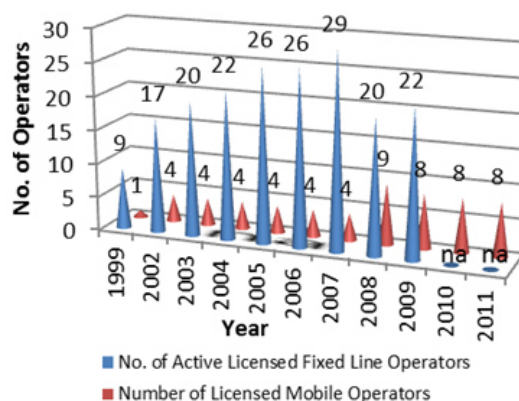Figure 1: Cumulative Investment in Telecom

Figure 2: Number of Licenced Operators

The huge investment and the increase in the number of operators over these periods have in turn translated into lower tariffs, higher teledensity and increased GDP. As indicated in figure 3, off-net mobile peak tariff declined drastically by over 65% between 2001 and 2012. Teledensity of only 0.73 in 2001 unprecedentedly soared to about 68.68 in 2012 (Figure 4). This size is more than the ITU's standard of 1:100 people. In terms of the contribution to GDP, the share of telecommunications has consistently risen by an average of 20% annually (Figure 5).
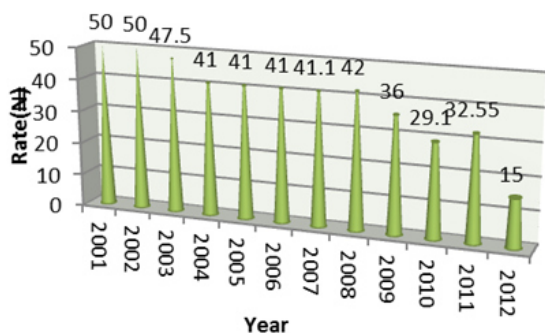

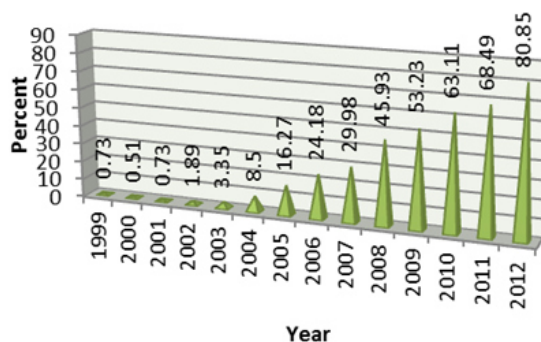Figure 3: Mobile Peak Off-Net Period Tariff
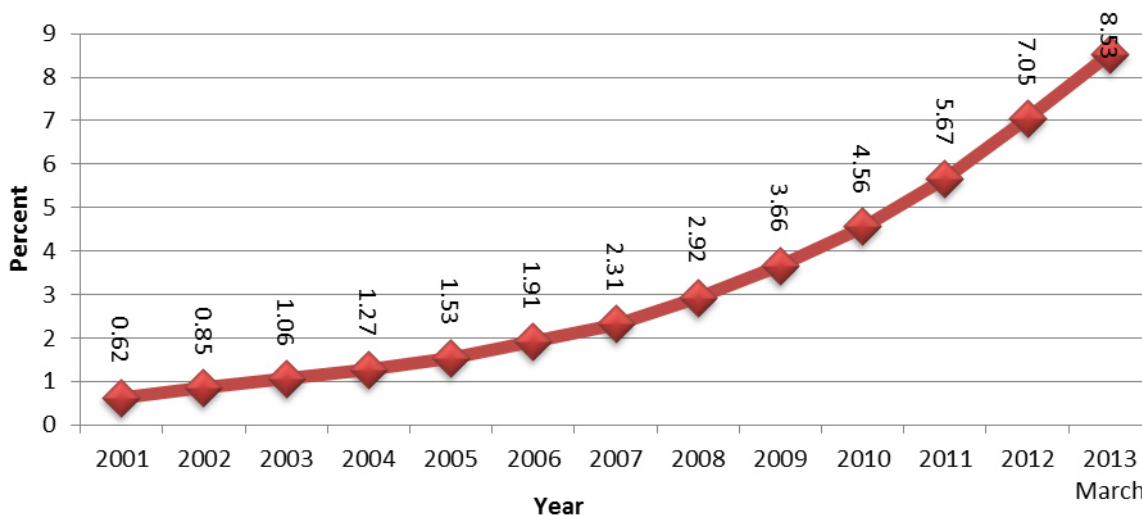

Figure 4: Teledensity

Figure 5: Contribution of Telecommunications to GDP

3.0 Methodology

This study employs trend analysis and the modified Engle-Granger model developed by Gregory and Hansen. The choice of Gregory and Hansen framework is threefold. First, it allows the inclusion of structural break in measuring long-run relationships. Second, the specification of the model with both step and slope dummies, provides the parameters to measure the separate effects of the reform and the reformed telecommunications sector on economic performance. Third, the stress and sometimes the error to detect the actual time when the structural change started is not an issue, because the model had been designed to adequately address that (Gregory and Hansen, 1996).

That said, we proceed with the general specification and the underlying assumptions of our empirical model. This is expressed in equation (1) as:

$$Y_t = \varpi_0 + \lambda_0 R_{tk} + \alpha_i \sum_{i=1}^{n} X_t + \varphi_i \sum_{i=1}^{n} RX_{tk} + \varepsilon_t \quad \text{...(1)}$$

From equation (1) Y_t denotes the regressand which in this paper is the economic performance (ECP). In turn, the economic performance indicators are; Gross Domestic Product (GDP), Unemployment (UEP) and Poverty (PVT). This implies that each of these indicators shall be regressed against the regressors. t is time subscript and k is the relative timing of the structural change (reform). R is a step dummy variable that is taken to represent the reform, such that $R_{tk} = \begin{cases} 0 \ if \ t \leq tk, \\ 1 \ if \ t > tk, \end{cases}$ X_t accounts for the independent variables where they are all I(1). RX_{tk}

represents the interaction variable alternatively called slope dummies. ε_t stands for error term which is I(0) and ϖ_0, λ_0, αi and φ_i are parameters to be estimated. Therefore, the explicit expressions of economic performances are as follows:

$$GDP_t = \varpi_1 + \lambda_1 R_{tk} + \alpha_1 TCM_t + \alpha_2 CPT_t + \alpha_3 M2_t + \varphi_1 RTCM_{tk} + \varphi_2 RCPT_{tk} + \varphi_3 RM2_{tk} +$$

$$\varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$UEP_t =$$
$$\varpi_2 + \lambda_2 R_{tk} + \alpha_4 TCM_t + \alpha_5 GDP_t + \varphi_4 RTCM_{tk} + \varphi_5 RGDP_{tk} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots (3)$$

$$PVT_t =$$
$$\varpi_3 + \lambda_3 R_{tk} + \alpha_6 TCM_t + \alpha_7 POP_t + \varphi_6 RTCM_{tk} + \varphi_7 RPOP_{tk} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots (4)$$

Telecommunications (TCM) is the common independent variable to the three equations (2-4). The control variables for equation 2 are Capital (CPT) and Money Supply (M_2). While GDP is used as the control variable for equation 3, Population (POP) is used for equation 3. From equation (2) – (4), the effects of the reform on GDP, UEP and PVT are λ_1, λ_2 and λ_3 respectively. In the same fashion, the effects of the reformed telecommunications are φ_1, φ_4 and φ_6. Apriori, we expect λ_1 and $\varphi_4 > 0$; λ_2, λ_3, φ_5 and $\varphi_6 < 0$.

3.1 Data and Sources
This paper used mainly secondary data of yearly frequency from 1984-2011. The data on GDP, PVT, UEP, POP, TCM and CPT were obtained from the publications and official websites of Central Bank of Nigeria, NCC and National Bureau of Statistics (NBS). In order to avoid the problem of large coefficients, we took the natural logarithm of the variables to bring large figures closer.

4.0 Empirical Analysis
4.1 Trend Analysis of Economic Performance and Telecommunications
Figure 6 shows the line graphs of the various measures of economic performance compared with the telecommunications output on a normalized scale. From this figure, the following behaviours between these variables can be observed.
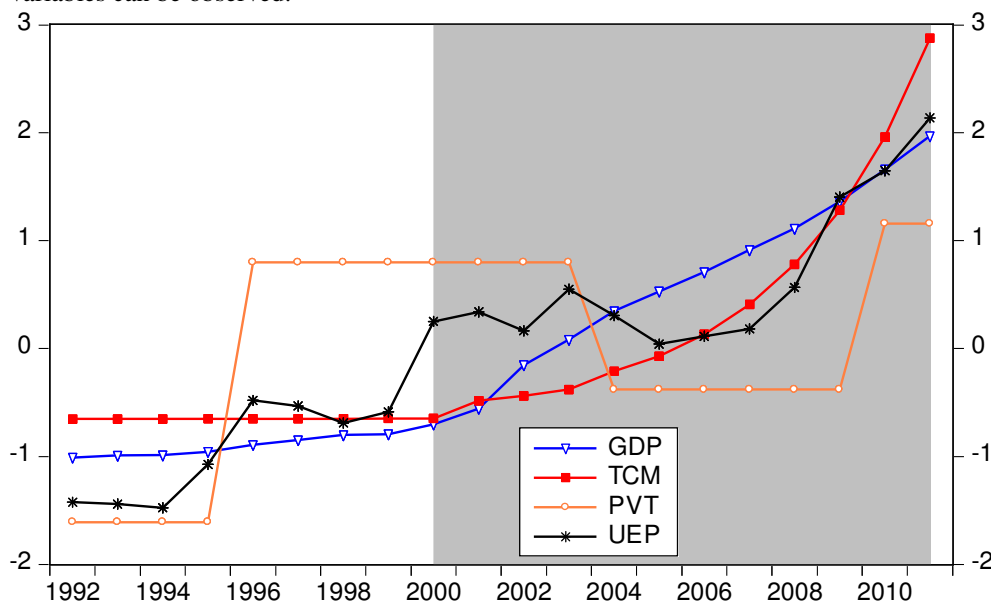
Figure 6: Line Graphs of GDP, TCM, PVT and UEP (1992-2011)

Prior to 2000, particularly from 1994 as can be seen from the figure; that when telecommunications output was very small gdp also remained very small; poverty incidence and unemployment rate were rising and to a large extend becoming unbearable. But following the reforms in 2000, TCM unprecedentedly increased in the following year and consistently rose over the rest of the period. Consequent to this, gdp contemporaneously and continuously skyrocketed over the remainder of the period. On the other hand, PVT and UEP which were

expected to decline exhibited a different pattern. As revealed from figure 6 that between 2000 and 2010, except in 2002, 2004 and 2005 when UEP dropped, it instead rose with the increase in TCM. PVT however, declined until in 2009 when it began to rise.

4. 2 Results and Discussion

In this section, we first examine the unit root status of the series in order to ascertain whether they are integrated of order one – I(1). Table 1 reports the estimates obtained from using Augmented Dickey Fuller (ADF) and Phillip-Peron (PP) unit root tests.

Table 1: Unit Root Results

| | Level | | First Difference | | |
	ADF	PP	ADF	PP	Comment
GDP	**-1.5302**	**-1.0440**	**4.2731****	**-3.3655****	**I(1)**
	{-3.5902}	*{3.5875}*	*{-2.9919}*	*{-2.9810}*	
UEP	**-1.6436**	**-1.3651**	**-3.8892****	**-3.8551****	**I(1)**
	{-3.5950}	*{3.5875}*	*{-2.9810}*	*{-2.9810}*	
PVT	**-2.8415**	**-2.9934**	**-5.9180****	**-5.9180****	**I(1)**
	{-3.5875}	*{-3.5875}*	*{-2.9810}*	*{-2.9810}*	
TCM	**-1.4979**	**-1.4858**	**-4.7287****	**-4.7287****	**I(1)**
	{-3.5875}	*{-3.5875}*	*{-2.9810}*	*{-2.9810}*	
CPT	**-2.8678**	**-2.8655**	**-6.4475****	**-8.8534****	**I(1)**
	{-3.6122}	*{-3.5875}*	*{-2.9862}*	*{-2.9810}*	
LBC	**-2.5984**	**-1.6399**	**-2.1298**	**-3.9108****	**I(1)**
	{-3.5950}	*{-3.5875}*	*{-2.9810}*	*{-2.9810}*	
POP	**-1.6336**	**-0.1598**	**-2.0081**	**4.0050****	**I(1)**
	{-3.6122}	*{-2.9810}*	*{-3.0207}*	*{-2.9810}*	

The bold figures are the tests statistics. Those enclosed in parenthesis-{ } are the critical values at 5% level .** indicates significance at 5% level.

The ADF test reveals that all the series, but not for LBC and POP, are I(1). PP test on the other hand suggests that all the series are first differenced series. As revealed in table 1, the test statistics are greater than the critical values at 5% level. This paper, in line with PP test, assumes that all the series are I(1). This is because PP has demonstrated to have higher power than ADF.

Table 2 which consists of three panels presents the empirical estimates of equations 2-4; it shows both the long-run and short-run estimates of equations 2-4 respectively. The figures in the first rows in each panel are the Hansen's L_c Statistic and error correction mechanism (ECM). The L_c statistic tests the null hypothesis of cointegration.

Table 2: Effects of Reform and Reformed Telecommunications on Economic Performance

Panel 1: Estimates of Equation 2

	Long -run				Short- run		
Variable	**Coefficient**	**t-Statistic**	**Prob.**	**Variable**	**Coefficient**	**t-Statistic**	**Prob.**
Lc Statistic	0.8753		0.0560	**ECM**	-0.5640**	*-4.1024*	0.0007
C	15.4725**	*9.2729*	0.0000	**C**	0.0151	*1.9082*	0.0734
R	-4.9713**	*-3.7882*	0.0013	**R**	0.9213**	*2.3951*	0.0284
TCM	-0.6996**	*-2.1365*	0.0466	**D(TCM)**	-0.0287	*-2.0502*	0.0561
CPT	0.0112	*0.1608*	0.8741	**D(CPT)**	0.0651	*1.7642*	0.0957
M2	-0.0007	*-0.1380*	0.8918	**D(M2)**	-0.0002	*-0.0921*	0.9277
RTCM	0.7342**	*2.2768*	0.0352	**RTCM**	0.0402**	*2.6486*	0.0169
RCPT	0.0965	*1.5952*	0.1281	**RCPT**	-0.0891**	*-2.3187*	0.0331
RM2	-0.0044	*-0.8413*	0.4112	**RM2**	0.0013	*0.7895*	0.4407

Panel 2: Estimates of Equation 3

Lc Statistic	0.1937		0.2000	**ECM**	-0.3483	*-1.4860*	0.1546
C	23.3808**	*3.0529*	0.0060	**C**	0.0758	*1.1648*	0.2593
R	-32.3629**	*-2.5322*	0.0194	**R**	-13.2855	*-0.8792*	0.3909
TCM	5.5224**	*5.0887*	0.0000	**D(TCM)**	0.1291	*0.7218*	0.4797
GDP	-3.9618**	*-4.1140*	0.0005	**D(GDP)**	-1.6981	*-1.3149*	0.2051
RTCM	-5.5806**	*-5.0756*	0.0001	**RTCM**	-0.2630	*-1.1161*	0.2791
RGDP	4.8842**	*3.7321*	0.0012	**RGDP**	1.1880	*0.9198*	0.3699

Panel 3: Estimates of Equation 4

Lc Statistic	0.4441		0.2000	**ECM**	-0.4813	*-2.0014*	0.0598
C	39.6780**	*2.8988*	0.0086	**C**	1.2033	*0.9553*	0.3514
R	-59.1501**	*-2.6625*	0.0146	**R**	-16.0925	*-1.0187*	0.3211
TCM	3.4109**	*4.3389*	0.0003	**D(TCM)**	0.0096	*0.3274*	0.7469
POP	-2.8689**	*-3.0331*	0.0063	**D(POP)**	-45.9999	*-0.9507*	0.3537
RTCM	-3.4942**	*-4.4314*	0.0002	**RTCM**	-0.0095	*-0.2378*	0.8146
RPOP	4.1646**	*3.0911*	0.0055	**RPOP**	0.8615	*1.0059*	0.3271

*Notes: the null hypothesis of Hansen's cointegration is "the series are cointegrated". ** indicates significance at 5% level.*

On the basis of the available information in the table, we have no evidence to reject this null hypothesis at the conventional 5% level for all the three equations. This implies the existence of long-run relationship between economic performance and telecommunications. The adjustment mechanism – the ECM terms in the three equations are negatively signed as expected. Equation 2 has the highest speed of adjustment when compared to equation 3 and 4. It shows that about 56% of the errors that occurred in the previous period are corrected in the present period. Except for the coefficient of R in equation 2, the coefficients of all the Rs and RTCMs carry the expected signs (panels 1-3). As shown in table 2, the reform and the reformed telecommunications have significant effects on growth both in the long-run and short-run. For instance, a 1% rise in the reformed telecommunications will trigger about 0.73% and 0.04% increase in growth respectively. The effects on unemployment and poverty are only significant in the long-run. From the results, the reform's coefficients (-32 and -59 for equation 2 and 3) against the reformed telecommunications' coefficients (-5.6 and -3.5 as above), show that reforms are critical to reducing unemployment and poverty. This finding is consistent with the institutional literature. Overall, our findings are in accord with the extant literature that growth in telecommunications performance improves economic performance. We emphasize here that these findings do not contradict the trend analysis which revealed positive correlation between them. The rising unemployment and poverty despite the growth in the sector, however points to the role of other factors which are inimical to

development.

5.0 Conclusion and Policy Implication

A vast body of literature claim that telecommunications has a multiplier effect on economic performance. This claim has made many countries to embark on institutional reforms in this sector following the argument that institutions are needed first. This paper examined the separate effects of the reform and the reformed telecommunications on economic performance in Nigeria. This is because, the trend in the telecommunications performance and some measures of economic performance made us to cast some doubt. Contrary to our doubt, we found that both the reform and the reformed telecommunications have significant effects on economic performance. The effect of reform appears to be the most important. From this finding therefore, we recommend that the Nigerian Communications communication should strategize ways to improve the institutions.

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