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THE IMPACT OF VALUE ADDED TAX IN THE RELATIONSHIP BETWEEN SOCIAL INFRASTRUCTURE AND ECONOMIC GROWTH IN NIGERIA: AN EMPIRICAL INVESTIGATION

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Abstract

The suggestion of Value-Added Tax (VAT) as a way-out dilemma for the government is predicated on the fact that it is capable of generating substantial revenue. However, its impact on social infrastructure and the growth of the economy needs to be unraveled. Therefore, this study investigated the relationship among value added tax, social infrastructure and economic growth in Nigeria using time series data covering the periods 1991 to 2020. Data were sourced from World Development Indicators (WDI) published by World Bank Organization and Central Bank of Nigeria Statistical Bulletin, published by Central Bank of Nigeria. Both the descriptive and inferential statistical tools were used. Precisely, the Augmented Dickey-Fuller (ADF) and the Philip-Perron (PP) tests of unit root engaged. The ordinary least square (OLS) techniques were used to analyse the data. The results revealed

that Value Added Tax (VAT) has positive and significant effects on both social Infrastructure and economic growth in Nigeria. The effect of social infrastructure on economic growth is positive and statistically significant. However, the impact of trade openness on Social Infrastructure is negative and statistically insignificant. Similarly, capital stock, inflation and trade openness have positive but insignificant effect on economic growth in Nigeria. Also, capital stock, inflation and labour have positive effect on social infrastructure. Similarly, capital stock, inflation and trade openness have positive effect on economic growth in Nigeria but the effects are statistically insignificant. However, the impact of labour on economic growth is negative and statistically significant which is contrary to theoretical stand. The study recommended that the governments should establish effective monitoring and evaluation systems to assess the impact of VAT on infrastructure development and identify the deficiencies, bottlenecks, or areas for improvement, to ensure that VAT revenues are optimally utilized for infrastructure and economic growth in Nigeria

Introduction

Value Added Tax (VAT) is a consumption tax levied at each stage of consumption chain and borne by the final consumer of the products or services (Cole, Aroyewun, Soetan & Akintola, 2021). It is a consumption tax imposed by the government on goods consumed and services rendered. The Nigerian government introduced VAT on 1st December, 1993 by Decree No 102 of 1993. The actual implementation was on 1st January, 1994. VAT is a consumption tax that has been embraced by many countries in the world. Evidence from earlier study supported the view that VAT revenue has significant effect when compared to total revenue earned by Nigeria government (Ogochukwu and Azubike, 2016). They cited that VAT revenue in 1994 was N8.189 billion compared to projected revenue of N6 billion and in 1995, N21 billion was generated from VAT compared to N12 billion projected revenue. Based on the revenue generation ability of VAT, researches are ongoing on importance of VAT to economic growth and development.

Nigeria is currently experiencing revenue crisis due to declining crude oil earnings and as such, the government is trying to improve its revenue potential by imposing more taxes (Ogbonna and Ebimobowei, 2017). The Federal Government attempted to increase the VAT rate to 10 per cent in 2007, but this was faced with stiff opposition resulting in the suspension of the proposed increase. The issue is that VAT rate in Nigeria has remained at 5 percent since its introduction in 1993 despite several attempts to review it upward by successive governments. However, the Nigerian government recently approved a 50% increase in the Value Added Tax (VAT) rate applicable on supply of goods and services in Nigeria, from 5 per cent to 7.5 per cent. The new rate took effect in the first quarter of 2020. Thus, the recently signed finance bill which has attracted public attention and met with mixed reactions.

Social Infrastructure assists in stimulating the educational; health related and culture related standards of the people, while economic infrastructure contributes in encouraging the economic activities, such as roads, highways, railroads, electricity, telecommunications, water supply among others. All the sectors of infrastructure are necessary for the human existence and social wellbeing.

Like energy is one of the most important constituent of economic infrastructure. Similarly, transport sector comprising of railways, road network, shipping and airways which are essential component of economic growth and social development of the country. However, the concern of this study is social infrastructure.

Intuitively, infrastructure is a promoter of the growth of the economy, and social infrastructure like education, health, power and transportation facilities is not less in influencing the growth of the economy. However, the findings earlier studies revealed mixed outcome.

From theoretical insights on the impact of social infrastructure on economic growth, the Human Capital Theory emphasizes the role of education and healthcare in enhancing human capital, which in turn drives productivity and economic growth. The New Growth Theory highlights the importance of technological progress and innovation, which are influenced by access to social infrastructure such as research institutions and information and communication technologies (ICT). Empirical studies have examined the impact of social infrastructure on economic growth, demonstrating positive associations in many cases. For instance, Aschauer (1989) found that public infrastructure investment, including social infrastructure, positively affects productivity and economic growth in the United States. Similarly, Selimi and Ahmeti (2017) documented a positive relationship between social infrastructure investment and economic growth.

Also, several theoretical frameworks have been developed to understand the relationship between VAT and economic growth. The traditional Keynesian view suggests that VAT can have a negative effect on economic growth by reducing consumption and aggregate demand. On the other hand, the supply-side economics perspective argues that VAT can promote growth by providing a stable revenue source for public investments and infrastructure development. Empirically, studies have examined the relationship between VAT and economic growth, yielding diverse findings. Some studies indicate a positive correlation between VAT and economic growth. For instance, Keho (2015) found that VAT has a positive effect on economic growth in African countries. Similarly, Fjeldstad and Rakner (2003) concluded that VAT has a positive impact on economic growth in Tanzania. However, other studies have shown mixed or inconclusive results. Navarro and Veiga (2013) found no significant relationship between VAT and economic growth in European Union countries. Similarly, Mavrotas and Kelly (2001) found that VAT had no statistically significant effect on economic growth in developing countries.

Therefore, this study sets out to unravel the impact of value added tax (VAT) on social infrastructure and economic growth in Nigeria using secondary data that spanned from 1991 to 2020. The data were sourced from Central Bank of Nigeria (CBN) statistical bulletin and World Development Indicators (WDI) published by World Bank organization.

Literature Review

Conceptual Review on Tax

Tax is one of the instruments of fiscal policy, through which a government raises funds for it to meet its financial obligations to the state and the citizenry. Owing to the dynamic concepts related to tax, several definitions have been given to the concept of "tax" by several authors and institutions. The Institute of Chartered Accountants of Nigeria (2006) and the Chartered Institute of Taxation of Nigeria (2002) defined tax as an enforced contribution of money to government pursuant to a defined authorized legislation. In other words, every tax must be based on a valid statute. Ihenyen and Ebipanipre (2014) define tax as a levy imposed by the government against the income, profit or wealth of the individuals and corporate organizations. Anyanwu (1997) defines taxation as a compulsory transfer of payment of money from private individuals, institutions or groups to the government. A precise definition of taxation by Ofoegbu, Akwu and Oliver (2016) is that taxation is one of the sources of income for government, such income as used to finance or run public utilities and perform other social responsibilities. However, Oriakhi (2002) however state that tax is a legal entity that compels the citizenry to pay irrespective of any corresponding returns of services, or goods produced by the government. This implies that tax is without quid-pro-quo. Hence tax is not the price paid by the taxpayer for any definite service rendered or a commodity supplied by the government.

A tax is a liability imposed upon the tax assesses who may be individuals, groups of individuals, or other legal entities. It is a liability imposed on a tax assesse premised on the possession of income, or that they own certain tangible or intangible property, or that they engage in certain economic activities that have been chosen for taxation. These imply that tax is imposed on a person's income or his/her property whether tangible or intangible. However, the fact that a public receipt has an element of compulsion does not necessarily connote tax; rather the absence of quid pro quo validates such compulsory payment as tax.

Thus from the last two paragraphs, tax implies two major concepts – legality; and quid pro quo. Hence a taxed individual or property must pay the money levied to it, and payment of tax does not warrant equating the service of goods consumed to the fee paid as tax. In this regard Oriakhi (2002) state that a tax imposition has a "base". Thus the concept of "tax base" is a related to tax. A tax base is defined as the legal description of the object with reference to which the tax applies. For example, the base of an excise duty is the processing of a specific good; and the base of an income tax is the income of the assesse. However, it is imperative to legally define each tax base, and each base has to be quantified for the purpose of ascertaining the tax liability of each individual taxpayer. Thus each taxpayer is considered as a legal entity. However, Oriakhi (2002) states that an individual legal entity may be subjected to more than one tax. In this regard such situation is termed as multiple taxes. More so, Oriakhi opines that each time base must have a dimension. This implies that each tax base must have its dimensions as to

when to make payments and how to make payments. Thus while determining a tax base, tax authorities must give due consideration to dimensions of each tax base.

Conceptual Review on Infrastructure

Infrastructure is the set of fundamental facilities and systems that support the sustainable functionality of households and firms. Infrastructure serves a country, city, or other area including the services and facilities necessary for its economy to function (Sullivan and Sheffrin, 2003). Infrastructure is composed of public and private physical structures such as roads, railways, bridges, tunnels, water supply, sewers, electrical grids, and telecommunications (including Internet connectivity and broadband access).

In general, infrastructure has been defined as the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions and maintain the surrounding environment (Fulmer, 2009). Especially in light of the massive societal transformations needed to mitigate and adapt to climate change, contemporary infrastructure conversations frequently focus on sustainable development and green infrastructure. Acknowledging this importance, the international community has created policy focused on sustainable infrastructure through the Sustainable Development Goals, especially Sustainable Development Goal 9. Industry, Innovation and Infrastructure" San Francisco Ferry Building at night one way by which to classify types of infrastructure is to view them as two distinct kinds: hard infrastructure and soft infrastructure (Dyer, Dyer, Weng, Wu, Grey, Gleeson, Ferrari and Tomás, 2019). Hard infrastructure refers to the physical networks necessary for the functioning of a modern industry. This includes roads, bridges, and railways.

Conceptual Review on Economic Growth

Economic growth is said to be the increase in per capita income and national output. For there to be an increase in the economic growth, it is expected that the level of investment is greater than the amount needed to replace the depreciated capital. According to Harrod (1939), Domar (1946) and Solow (1962) the amount of savings and investment plays a significant role in the economic growth process.

The Solow growth model places importance on the diminishing returns on capital and forecast a stable per capita income in the long run. In a general concept, economic growth refers to an increase in the national income or national output. It is expected to know that an increase in economic growth which is caused by use in input which includes labor productivity, energy or materials, physical capital is said to be an intensive growth while a growth in the national income which is only caused by rise in the inputs amount that is available for use is said to be extensive growth. The available inputs therefore could be increased population or a new territory.

Theoretical Review

Theoretical Review on Tax

The concept of tax in the literature revealed two major positions

on the imposition of tax. Classical economics as argued by Smith (1776) stated that minimum taxes should be imposed so as not to distort the working of the market system. Smith argued that taxes are however needed for the government to raise funds and provide an enabling environment for the private sector to flourish, such as providing security and infrastructure. However Keynesian economics argues that the imposition of taxes is expedient for achieving macroeconomic goals. Consequently, studies have investigated the relevance of tax in economic performance as well as to its importance to government revenue and the adverse effects it creates.

Adams (2001) highlighted the importance of tax by stating it is the most important source of revenue for modern governments, typically accounting for ninety percent or more of their income. Okon (1997) asserts that income tax is a tool of fiscal policy used by government all over the world to influence positively or negatively particular type of economic activities in order to achieve desired objectives. Thus income tax serves as a channel to direct economic performance towards a prescribed target. Okon (1997) further stated that tax rate could be fluctuated to achieve a specific economic goal. Thus tax rates are not always increased, but also decreased to meet specific macroeconomic goals. Pfister (2009) opines that taxation is central to the current economic development agenda in Africa. This is premised on the fact that it provides a stable flow of revenue to finance development priorities, such as strengthening physical infrastructure, and is interwoven with numerous other policy areas, from good governance and formalizing the economy, to spurring growth. According to Bonu and Pedro (2009) traditional schools of thought advocated the theory of low income tax rates' influencing economic development; however modern schools of thought propagated the theory of higher income tax rates producing greater economic growth, especially for developed nations. However, Besley and Persson (2014) attribute the growth of developed economies to tax; but they stressed that the same cannot be said for developing countries owing to the poor tax administration in such economies and the low tax rates in such economies.

Theoretical Review on Infrastructure

Infrastructure development is the construction of basic foundational services in order to stimulate economic growth and quality of life improvement. Most advanced economies have gone through periods of intensive infrastructure building that have improved the efficiency and competitiveness of regions. Infrastructure includes roads, bridges, waste management and telecommunications equipment are just a few types of infrastructure that people use daily.

Infrastructure is the support system of industrial and agricultural production, and foreign and domestic businesses. It is the basic organizational and physical structure that is required to run a business smoothly. In an organization or for a country, a basic infrastructure includes communication and transportation, sewage, water, education system, health system, clean drinking water, and monetary system.

A country's economic and social development is directly dependent on a country's infrastructure. Many developed countries make a lot of progress because of the enormous growth of economic and social infrastructures. A good infrastructure makes the work process easier, resulting in a positive and high productivity.

Infrastructure could be categorized as economic infrastructure, which directly linked with the economic development of a country or an organization. This includes the basic amenities and services that directly influence and benefit the production process of economic distribution. A few examples of economic infrastructures are power, transportation, irrigation, communication, etc. another one is the social infrastructure which has the basic services that improve individual productivity and achieve social objectives. Social infrastructure contributes indirectly to the country's economic development.

Theoretical Review on Economic Growth

According to the Malthusian hypothesis, technical advancement resulted in higher population increase for most of human history, but had no long-term impact on per capita income. While technologically advanced countries had a larger population density during this period, their per capita wealth was comparable to that of technologically backward societies, according to the theory.

In classical (Ricardian) economics, the theory of production and the theory of growth are based on the theory or rule of variable proportions, which states that increasing one of the factors of production (labor or capital) while keeping the other constant and assuming no technological change increases output, but at a decreasing rate that eventually approaches zero. These concepts can be traced back to Thomas Malthus' agricultural theories. Malthus gave two examples: the number of seeds gathered versus the number of seeds planted (capital) on a plot of land, and the length of the harvest from a plot of land versus the number of employees were two examples provided by Malthus Robert Solow and Trevor Swan developed what would become the most widely used growth economics model in the 1950s. This model posits that the returns on capital and labor are diminishing. Capital grows as a consequence of investment, while its value or stock decreases as a result of depreciation. Because annual capital spending equals annual depreciation, even while technical advancement is not created, economic output/worker progressively approaches a position where capital per worker and economic output/worker are comparable. This is known as the "steady state."

Unsatisfied with the Solow–Swan model's assumption of exogenous technological progress, economists worked in the 1980s to endogenize (i.e., explain productivity growth "from within" the models); The endogenous growth hypothesis that emerged, was popularized by Robert Lucas, Jr. and his student Paul Romer, provides a mathematical explanation for technological development.A new definition of human capital was also added in this model, which refers to the skills and competence that enable people to be productive. Human capital, unlike physical capital, grows at a faster rate.

The focus of this study has been on factors that increase human capital (such as education) or technical advancement (for example, innovation). The Schumperian theory, named after Austrian economist Joseph Schumpeter in the twentieth century, formed the basis for one branch of endogenous growth theory. In terms of creation, businesses implement new goods or processes in the hopes of winning markets and earning from monopoly-like profits, whereas in terms of destruction, entrepreneurs implement new goods or processes in the hopes of gaining markets and profiting from monopoly-like profits. As a result, out-of-date technologies or products become obsolete. This could be understood as the cancellation of earlier innovations, rendering them obsolete, and "erasing the rents created by previous inventions."

Empirical Review of Literatures

Empirical studies on the relationship among Value Added Tax (VAT), Social infrastructure and economic growth in Nigeria are reported in this section.

Gashi, Asllani and Boqolli (2018) analyzed the effect of the tax structure in the economic growth of Kosovo in the period 2007-2015. The study evaluated the impact of specific types of taxes on economic growth. The methodology was based on comparative analysis of data using primary and secondary sources. Through the econometric model and linear regression analysis, the research hypotheses were tested. The model estimated includes several independent variables (types of taxes), and the dependent variable GDP. Based on data obtained through the log-log model, the results showed that the impacts of personal tax (Pt) and withholding tax (Wt) on economic growth are negative, while the impacts of income tax (It), Value Added Tax (VAT), individual businesses tax (Ibt), tax on interest, on dividends, on rent, on the win of the lottery or other gambling games (Tdr) and corporation tax (Ct) on economic growth are positive. The findings imply that not all taxes have the same impact on economic growth.

Ojong, Ogar and Oka (2016) investigated the impact of tax revenue (proxied using petroleum profit tax and personal income tax) on economic growth (proxied using gross domestic product) in Nigeria. The study covered periods of periods of 1986-2010. The study made use of the OLS method, and found that tax did not exert significant impact on economic growth in Nigeria.

In recent literature, Uket, Adesola and Essien (2020) analyzed the effects of taxation on development in Nigeria, using time series data from 1994-2018. Taxation was measured using petroleum profit tax, value added tax and company income tax; whereas GDP was used as proxy for development. The OLS method was engaged to analyze the data. The results obtained showed that all the three measures of taxation had positive impacts on GDP in Nigeria, but while value added tax and company income tax exerted significant impact, petroleum profit tax did not significantly improve GDP.

Izedonmi and Okunbor (2014) investigated the role of VAT in the economic growth of Nigeria from the year 1994 to 2010 the study made use of Cobb Douglass regression to analyse the time-series data that was drawn from

CBN statistical bulletin and Federal Inland Revenue Service. The result from the test disclosed a positive and significant relationship between VAT and economic growth proxy by GDP. Nasiru and Abdullahi (2016) examined the impact of value-added tax on the economic growth in Nigeria data from the study were gathered from the Central Bank of Nigeria statistical bulletin, Nigeria Bureau of Statistical and Federal Inland Revenue Service from the year 1994 to 2014 these data were analyzed using Johansen co-integration test. The findings from this study revealed that VAT has a positive and significant long-run relationship with GDP.

Gatawa, Aliero and Aishatu (2016) investigated the impact of VAT on economic growth in Nigeria. The study used the method of Johansen co-integration test. The study established evidence of a significant positive impact of VAT on economic growth. In the same vein, other government revenue other than VAT was also found to be positively related to economic growth. George-Anokwuru, Olisa and Obayori (2020) used DOLS to empirically investigated indirect tax and employment generation in Nigeria. The empirical results, showed that indirect tax measures by value added tax (VAT) and custom duties has a direct link and significant impact on employment generation in Nigeria.

Cole, Aroyewun, Soetan & Akintola (2021) investigated the relationship between Value Added Tax (VAT) and economic growth in Nigeria from 2004 to 2018. Secondary data obtained from both Central Bank of Nigeria statistical bulletin and National Bureau of Statistics (NBS) was used for the study. Regression analysis was adopted to analyze the data. The results showed a positive and significant relationship between Value Added Tax and economic growth in Nigeria. This finding is in line with the study of Ogochukwu and Azubike (2016), and Izedonmi and Okunbor (2014) that VAT revenue had positive and significant relationship with economic growth in Nigeria. The study recommended that Value Added Tax (VAT) should be sustained and all identified loopholes should be covered for VAT revenue to continue to contribute more significantly to the growth of Nigeria economy.

Past studies conducted on Nigeria with most of the studies leaning toward a positive impact of some selected social infrastructures on economic growth. Kayode, Babatunde, and Abiodun (2013) researched the effect of public investment in transport on economic growth in Nigeria using the Ordinary Least Squares (OLS) regression method and time series data. The dataset for the study covered from 1977 to 2009. The findings showed that transportation impacted insignificantly on economic growth. Intuitively, transportation promotes development either directly or indirectly. Also, according to Morrison and Schwartz (1996), providing infrastructure increases the efficiency of private organization and contributes to production output.

Aigbinode (2016) stated that telecommunication sector has changed Nigerian culture in various ways starting from the beginning of the new millennium. In any case, as promising as the communications industry is in Nigeria, there is a need to do an all-encompassing relative review to investigate the socio-economic effect of

telecommunication entrance in Nigeria. Azubike and Obiefuna (2014) noted that the telecommunications sector has generated about 25 billion US dollars from direct foreign investment into the nation while to the extent that job opportunities, a numeric value of 1,135,000 occupations were created. The business has developed so much that it assists the improvement of administration sectors such as IT, insurance, consultancies, banking, transportation, and Small and Medium Scale Enterprises (SMEs). There has likewise been a basic improvement in the activities of the economy.

Omodero and Nwagwa (2020) tested for the degree of co-integration among economic growth and education in Nigeria and the causality impact of education on economic growth. The Johansen co-integration and Granger causality tests findings indicated that education and financial development in Nigeria have long term co-integration while the Granger causality test revealed that education and gross enrolment proportion of advanced education are not influencing economic advancement. Hussaini (2020) researched on the long-term relationship between higher education and financial advancement. The study confirmed affirmative comprehensive relationship between financial advancement and higher education enrollment proportion. The author concluded that the nature of human resources required for economic growth would give more serious consideration to advanced education.

Hassan and Rafaz (2017) carried-out a simple standard least squares methodology to evaluate the effect of female education on the financial development of Pakistan for a period spanning 1990 to 2016. The study surveyed the effect of the power emergency and the techno-financial examination of a proffered answer for the impending power crisis in Nigeria (Mukhtar, 2021). Time series regression models are utilized to examine the impact of force utilization on financial turn of events and natural supportability. Findings from the result showed that there exists positive and strong impact power utilization and Nigeria's economy, as well as high negative impact of power utilization on gross domestic reserve funds.

Kareem, Arije and Avovome (2020) investigated Value Added Tax (VAT) and Economic Growth in Nigeria. The objectives of the study were to examine the impact of value added tax and economic growth and to determine the causal relationship between VAT and economic growth in Nigeria. Secondary data sourced from Central Bank of Nigeria Statistical Bulletin was used for the study. The data properties were tested for unit root using Augmented Dickey-Fuller, Bound test co-integration was used to test for the long run relationship between the variables. The result revealed that value-added tax positively and significantly impacted on economic growth in Nigeria both in the long-run and short-run. The causality test also indicated that there was a causal relationship between Value Added Tax and economic growth in Nigeria during the period under study. The study therefore recommended that government should increase the VAT rate and eliminate every VAT revenue leakage since it was found to have

positive effect on economic growth in Nigeria

Gap from the Reviewed Literature

From the reviewed literature, mixed results were found. For instance, Ihenyen and Ebipanipre (2014) found that both VAT and CIT had positive significant impacts on economic growth in Nigeria, Uzoka and Chiedu (2018) found a significant positive impact on economic growth in Nigeria, and Gashi, Asllani and Boqolli (2018) found that not all taxes have the same impact on economic growth. Gale and Samwick (2014) reviewed how changes to the individual income tax affect long-term economic growth, and found that tax rate cuts may encourage individuals to work, save, and invest, but if the tax cuts are not financed by immediate spending cuts they would likely result in an increased budget deficit, which in the long-term would reduce national saving and raise interest rates. The authors' findings further suggested that not all tax changes would have the same impact on growth. Also, Uket, Adesola and Essien (2020) discovered that value added tax and company income tax exerted significant impact on economic growth, while petroleum profit tax did not significantly improve economic growth, while Ojong, Ogar and Oka (2016) found that tax did not exert significant impact on economic growth in Nigeria.

Stoilova and Patonov (2012) found that tax structure based on direct taxes was more efficient in promoting economic growth. According to the discovery in the reviewed literature by Myles (2000), having reviewed the theoretical and empirical evidences and stated that although empirical tests of the growth effect face unresolved difficulties, but the empirical evidence pointed strongly at the fact that the effect of tax on economic growth is very weak. This gives room for further research in this area.

Methodology

The focus of this section is the methodology for the study. In this section, the model specification, the description and measurement of variables, types and sources of data, and the estimation technique are presented.

Model Specification

The objectives of this study inform the choice of model specified. Following the work by Kareem, Arije and Avovome (2020) in which economic growth is endogenized, a multiple regression model estimation technique is engaged. Three models/equations were set up, each representing the specific objectives. The main variables are Economic growth (*ECOG*), Social infrastructure (*SINFR)* and Value Added Tax (VAT), while other variables are control variables (*R*). The functional relationship is expressed as follows:

$$ECOG = f(VAT, R) \quad \ldots\ldots(1)$$
$$SINFR = f(VAT, R) \quad \ldots\ldots(2)$$
$$ECOG = f(SINFR, R) \quad \ldots\ldots(3)$$

Where

$ECOG$, *SINFR, and VAT* are Economic growth, Social infrastructure and Value Added Tax (VAT), respectively.

R is a vector of control variables for equations 1, 2 and 3 respectively.

If '*R*' represents the control variables; capital (*CAP*), trade openness (*TOPEN*), inflation (*INFL*) and labour (*LABOR*), equations 1 to 3 can be written as equations 4, 5 and 6 as follow;

$$ECOG = f(VAT, CAP, TOPEN, INFL, LABOR) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$
$$SINFR = f(VAT, CAP, TOPEN, INFL, LABOR) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$
$$ECOG = f(SINFR, CAP, TOPEN, INFL, LABOR) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(6)$$

The transformation of the above model into a regression function is given below:

$$ECOG_t = a_0 + a_1 VAT_t + a_2 CAP_t + a_3 INFL_t + a_4 LABOR_t + a_5 TOPEN_t + e_t \ldots(7)$$
$$SINFR_t = b_0 + b_1 VAT_t + b_2 CAP_t + b_3 INFL_t + b_4 LABOR_t + b_5 TOPEN_t + \emptyset_t \ldots(8)$$
$$ECOG_t = c_0 + c_1 SINFR_t + c_2 CAP_t + c_3 LABOR_t + c_4 TOPEN_t + c_5 INFL_t + v_t \ldots.(9)$$

Where

$a_0,\ b_0\ and\ c_0$= intercept terms,

ECOG = economic growth measured by real gross domestic product

TOPEN = Trade openness measured by the ratio of the sum of export and import to gross domestic product

LABOR= labour force

CAPITA = capital stock measured as gross fixed capital formation

INFLAT = inflation measured as the consumer price index

A-priori Expectation: It is expected that for the first objective of effect of VAT on Economic growth (*ECOG*), the apriori expectation for the parameters in equation (7) is $a_1, a_3 < 0\ and\ a_0, a_2, a_4, a_5 > 0$, while for the objective two which is the effect of VAT on Social Infrastructure (*SINFR*), the apriori expectation for the parameters in equation (8) is $b_0, b_1, b_2, b_4, b_5 > 0\ \ and\ \ b_3 < 0$. Also, for the third objective of impact of Social Infrastructure (*SINFR*) on Economic growth (*ECOG*), the apriori expectation for the parameters in equation (9) is $c_0, c_1, c_2, c_3, c_4, c_5 > 0$.

Description and Measurement of Variables

Value Added Tax (VAT): Value Added Tax (VAT) is a consumption tax paid when goods are purchased and services rendered. It is a multi-stage tax. VAT is borne by the final consumer. All goods and services (produced within or imported into the country) are taxable except those specifically exempted by the VAT Act. This is measured as percentage of value added tax to GDP

Social Infrastructure: Social infrastructure is comprised of the facilities, spaces, services and networks that support the quality of life and wellbeing of our communities. It helps us to be happy, safe and healthy, to learn, and to enjoy life.

Trade openness: Trade openness is defined as the ratio of exports plus imports over Gross Domestic Product (GDP). Openness is an indispensable enabler of growth, job creation, and poverty reduction. Trade provides new market opportunities for domestic firms, stronger productivity, and innovation through competition

Economic Growth (*ECOG* is the increase in the inflation-adjusted market value of the goods and services produced by an economy over time. Statisticians conventionally measure such growth as the percent rate of increase in real gross domestic product, or real GDP. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant local currency.

Inflation is a general increase in prices and a quantitative estimate of the rate at which the decline in purchasing power occurs. It can be reflected in the increase of an average price level of a basket of selected goods and services in an economy over some period of time. Inflation is as measured by the consumer price index which reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.

Labour is the labour force. Labour force comprises people ages 15 and older who supply labor for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. Not everyone who works is included, however. Unpaid workers, family workers, and students are often omitted, and some countries do not count members of the armed forces. Labor force size tends to vary during the year as seasonal workers enter and leave.

Capital stock (*CAP*) is the purchase of a capital asset that is expected to produce income, appreciate, or both generate income and appreciate in value. Examples of capital assets include land, buildings, machinery, and equipment. In this study, capital stock is proxied by Gross fixed capital formation (formerly gross domestic fixed investment). Gross fixed capital formation includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. Data are in constant local currency.

Data Presentation and Analysis

This section reports the analysis of the data on the relationship among Value Added Tax (VAT), Social Infrastructure and Economic growth in Nigeria. The section entails the descriptive statistics of the data and the results of the evaluation of the set objectives.

Pre-Estimation Tests

This section reports the pre-estimation tests which include the descriptive statistics of the data and the unit root tests. Sub-sections 4.2.1 and 4.2.2 show the descriptive statistics of the data and the unit root tests respectively.

Descriptive Statistics of the Data

The first issue to be examined is the descriptive statistics of the data. The descriptive analysis of the data provides information on the sample statistic of the data. The statistics include mean, median, minimum and maximum values, and standard deviation of the data. Secondly, the inference on the normality assumption of the distribution of the selected sample is reported using the kurtosis, skewness and Jarque-Bera statistics. Jarque-Bera statistic follows a chi-square (χ^2) distribution. The reports of these characteristic are shown in table 1.

Table 1: Summary of the Descriptive Statistics and Normality Distribution of the Data

	LVAT	***LSINFR***	***LRCAP***	***LABOR***	***INFL***	***ECOG***	***TOPEN***
Mean	5.0287	4.9142	29.782	4.0738	18.454	31.303	44.26701
Median	5.3554	5.1469	29.759	4.0990	12.716	31.318	42.84557
Maximum	7.0817	7.2396	30.069	4.1053	72.836	31.909	68.84908
Minimum	1.6603	0.2898	29.557	3.9786	5.3880	30.711	26.42950
Std. Dev.	1.7633	1.9187	0.1401	0.0431	16.797	0.4626	10.43351
Skewness	-0.5929	-0.7340	0.3017	-1.0315	2.0853	-0.0021	0.856378
Kurtosis	2.0983	2.5834	2.0109	2.2413	6.1950	1.3841	3.387991
Jarque-Bera	2.7744*	2.9109*	1.6780*	6.0393*	34.502	3.26401*	3.855085*
Probability	0.2498	0.2333	0.4321	0.0488	0.0000	0.1955	0.145505
Observations	30	30	30	30	30	30	30
NB: * Indicates normal distribution of the series at 5 percent level of significance							

Source: ***Authors Computation***

As shown in table 1, all the series displayed high level of consistency as the mean and median values are within the range of minimum and maximum values of the series. Each variable has 30 observations. Also, the standard deviation (S.D), which measures the level of variation or degrees of dispersion of each series from its mean value are shown in the table as generally low. The highest standard deviation value is 16.797 (that is, Inflation; *INFL*) while the lowest is 0.0431 (that is, Labour; *LABOR*).

The results further show that capital stock (*CAP)*, inflation (INFL), and trade openness (*TOPEN)* are positively skewed while the rest [economic growth (ECOG), Value Added Tax (VAT), Social Infrastructure (*SINFR*) and labour (*LABOR*)] are negatively skewed. Skewness reports the degree of asymmetry or departure from symmetry of a series distribution while kurtosis gives information about the degree of peakedness of distributions. The probability values of the Jarque-Bera statistics at 0.01 revealed that all the series are normally distributed {inflation, for capital stock (*CAP)*, economic growth (ECOG), Social Infrastructure (SINFR), labour (*LABOR*)] and trade openness (*TOPEN)*}, except for inflation (INFL). This implies that the normally distribution assumption is valid for almost all the series in the variables at 1 percent level of significance.

Unit Root Test

The unit root tests report the nature of stationarity or otherwise of the series for a variable under consideration. Two different tests of unit roots were carried-out for the purpose of robustness. They are the Augmented Dickey-Fuller (ADF) and the Philip-Perron (PP) tests. The reports of the unit roots tests are shown in table 2. Policy and inflation under the

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