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ANALYSIS OF THE CONTRIBUTIONS OF TRANSPORT SECTORTOECONOMIC GROWTH IN NIGERIA

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Abstract
This paper empirically examined the contributions of transport sectorto Economic Growth in Nigeriawith the application of the Phillips-Perron test statistics, Johansen Cointegration techniques, Pairwise Granger Causality techniques and the error correction mechanism on a multiple log linear regression framework.The annual time series data from 1981 to 2019 on economic growth(Real gross domestic product (RGDP) and transportation variables (Road transport (RDTP), Rail transport and pipelines (RLTP), Water transport (WRTP), Air transport (ARTP), Transport services (TPSS) and Post and courier services (PTCS)were sourced from Central Bank of Nigeria Statistical Bulletin (2019).The results of the Phillips-Perron test statistics showed that all the variables (RGDP, RDTP, RLTP, ARTP and PTCS) were stationary at first difference I(1) except WRTP and TPSS which were stationary at level I(0), while the Johansen unrestricted cointegration rank test results showed the existence of a unique long run relationship between RDTP, RLTP, WRTP, ARTP, TPSS and PTCS, as both Trace and Max-Eigen statistics revealed twocointegrating equations respectively. The short run error correction mechanism results showed that the entire explanatory economic and transportation variables in the estimation met their expected signs except WRTPand TPSS. The empirical results also revealed that RDTP, ARTP and PTCS had direct and significant contributions to real gross domestic product in Nigeria.This means that 1 per cent increase in RDTP, ARTP and PTCS increased RGDP by 36.0, 15.8 and 72.6 per cent respectively. The results further revealed that WRTP and TPSS had inverse relationship with RGDP in Nigeria. Thus, 1 per cent change in WRTP and TPSS discouraged growth by 31.2 and 0.25.5 per cent respectively, due to the crowding out effect.The error correction mechanism (ecm) of -0.212333 was statistically significant and had the appropriate sign. It suggest however, that there is a very low adjustment process in the activities of the transportation sector in Nigeria since the speed of adjustment is 21.2per cent approximately. Also, the Diagnostic and stability tests confirmed the robustness of the model over time, while the causality between WRTP and RGDP; TPSS and RGDP in Nigeria both exhibited unidirectional causation as their pro-values are less than 0.05(P<0.05).The studytherefore, recommended that the regulatory authorities of the ministry of transportation should strengthen policy on the maintenance and renovation of transport facilities, as well as overhauling of the entire transport infrastructural development in Nigeria, to meet up with the increasing demand of transportation services and sustain economic growth in the country.

Keywords: Real gross domestic product, Road transportation, Rail transportation and pipelines, Water transportation, Air transportation, Transport services, Post and courier services.

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I. Introduction

Development is crucial and essential to the sustenance and growth of any nation. Adeniran and Yusuf [1] reported that the development of transport in the overall activities of a nation is the ability to deliver an improved, efficient, effective, affordable, accessible, safe, reliable and an integrated transport system which will prosper the economic, social and political segments of the nation.Transport systems are closely related to socioeconomic changes. The mobility of people and freight and levels of territorial accessibility are at the core of this relationship. Economic opportunities arises where transportation infrastructures answers mobility needs and insure access to markets and resources. Many scholars have delved into the study of transportation as an essential sector which its development is required for moving an economy forward. This is because transportation is crucial to national and international competitiveness. It is believed that the sector plays significant role in ensuring economic growth and development, and the life wire of any society [2]; [3]. A good number of researchers focused on the transport infrastructure as essential for effective economic growth [4]; [5]. Economic activity in a country requires easy movement of resources like manpower, raw materials, capital

assets and other variable inputs from one point to the other. It equally includes evacuation of outputs and food items from point of production to both domestic and foreign markets; from place of abundance to place of scarcity and other points of need. Transportation involves motor transport with good road network, railway with functional railway lines, water transport with well dredged water channel, and Airways with standard aviation facilities. Besides, effective transportation enhances efficient distribution of resources and proper management of commerce, government business and international transaction [6].

Transportation is the medium through which finished goods are moved by air, land or by water from the manufacturer to the final consumers. The means or mediums of transportation are by Aeroplanes, Ship, Cars, Lorries and Train [7]. Transportation is a derived demand. The demand from a given location depends on the existence of demand of passengers and goods in the distant location. Transportation plays an important role in helping to bridge the demand and supply gap inherent in production approach between the geo-political zones of the economy. Transportation affects every individual directly or indirectly. The place we go to, the goods we consume and the entertainment are impacted by transportation. The growth of the Nigerian economy is attributable in part to the transportation system of the economy [8].

Transportation constitutes one of the major features of the economic development of Nigeria. Over the years, scholars have debated on a number of issues related to the exact role of transportation in economic development such as the timing of the investment in transport infrastructure, how it works, the amount of transport investment needed for a specific level of development and many other aspects. The answers to these questions are not very easy to obtain because the demand for transportation is a "derived demand" while transport affects and is affected by many other sectors of the economy. While the debate on the role of transportation on economic development continues, some scholars emphasize that where a nation is lacking in the factors conducive to growth, no amount of transport investment can produce economic development. Fortunately, Nigeria is not lacking in resources and other factors conducive to growth. A wide range of transport facilities already exist in Nigeria and may range from primitive footpaths and dirt roads with human or animal haulage to modern super highways or expressways, railways and airways [9].

Transportation infrastructure investment is critical to the economic well-being of Nigeria. These investments enhance mobility and provide our people with increased business and work opportunities. Advancing integrated, multi-modal networks provide travel options that improve connectivity, affect the health and well-being of urban and rural communities, and contribute to creating "smart" cities through the 21st century. Also, continuous re-investment is important to sustaining and advancing the Nigerian's competitive advantage in the worldwide marketplace. It allows companies to establish lean supply chains and deliver competitively priced products and services, while at the same time achieving healthy profit margins [10].

Good transportation infrastructure is essential in economic development. It promotes factor mobility and reduces trade costs. In addition, it promotes market integration, thereby providing avenue for the reduction of price volatility and reallocation of resources in line with comparative advantage. Investments in transportation infrastructure can also influence the productive capacity through its use as a direct input in the production process thereby increasing such resources. For example, a newly constructed road allows goods to be transported to market quicker thereby reducing the total cost of production and transportation. On the other hand, transportation infrastructure may affect economic output by changing aggregate demand through the creation and increased demand for intermediate inputs from other sectors with concomitant multiplier effects in the economy. Such infrastructure can also indirectly enhance the productivity of existing resources. Furthermore, it can lead to "agglomeration effect" which is the magnetic or catalytic pull or attraction of resources from other regions to the area of infrastructural development by lowering production and distribution costs, stimulating private investments, improving labour productivity and engendering technological innovations. In the light of the considered effect of transportation infrastructure on economic growth, there is the need to empirically examine whether transportation capital causes economic growth causality in the Nigerian case [11].

Historically, transportation in Nigeria dates back to the colonial era where road network, rails, and water (inland and sea water ways), were tailored towards the gains of the colonialist in the exportation of cash crops, such as groundnuts, cocoa, cotton and palm produce and to the importation of cheap, mass produced consumption goods. These early transport systems were planned in based on the then economic situation, as typified in sub-standard road and rail alignments and a sub base, which later proved inadequacy to accommodate heavy vehicles. But following the independence of the country in the 60s, transport became one of the instruments of the country and an important tool for social and economic development [12].

At present, the means or mediums of transportation in Nigeria include road transport, rail transport and pipelines, water transport, air transport, transport services, post and courier services [13]. In recent times, the transport sector has been grossly underdeveloped. The decay of transport systems in Nigeria can be attributed to several factors including lack of development of a master plan for the sector, low public investment in transport services and infrastructure in the form of poor funding, poor maintenance culture, policy non-implementation and reversals, corruption, lack of strong political will, etc. These and many other factors are responsible for the

poor state of our transportation system in Nigeria [14]. The prompting question is, to what extent has the transport sector contributed to the growth of the Nigerian economy? This study therefore becomes imperative to empirically analyze the contributions of transport sector to economic growth in Nigeria using annual time series data from 1981 to 2019. The study is subdivided into five sections. Section one is the introduction, while section two and three focuses on literature review and research methods. Section four deals with data presentation, analysis and discussion of results, and Section five presents the concluding remarks and recommendations.

II. Literature Review

2.1 Conceptual Issues

Transport which can also be referred to as transportation was derived from two Latin words 'trans' which mean 'across' and 'portare' which mean 'carry'. Longman Dictionary of Contemporary English [15] defined transportation as a process or business of taking goods from one place to another or a system for carrying passengers or goods from one place to another. According to Good and Jebbin [16] transportation is a system for carrying passengers, raw materials and goods from one place to another both internally and internationally, often through power driven machines. It is commonly said to refer to movement of people and goods from one place to another [17]. Transportation service is the port of physical distribution activity which is concerned with the actual movement of goods to their various consumers [16].

Transportation of goods and services including humans from one place to another is vital to the transformation of any nation. Therefore, the commercial nerve of development is imbedded in effective transport system. More importantly, without transportation, nations, regions and the world at large would be restricted in developmental activities and this makes transport system indispensable factor for physical and economic growth [18]. A good transport system gives people the gift of flexible movement, civilization, source of well-being and wealth that brings people and from village to city and vice-versa. As important as the vein is to blood flow in human body's survival, so also is the transport system to the economy [19]. Therefore, the development and advancement of various transportation means has become pivotal to physical and economic growth of any nation. The means such as roads, railways, air, sea, inland waterways, pipelines, ropeways and cableways etc. are inevitable for the global and urban economic survival [20]. Also, Akintayo [21] emphasized the role of transport of economics in national development through all sectors, but road and rail transport play complementary roles for movement of goods and services. Road transport is said to dominant land transportation in less developed countries but a complement from rail can drive their economic development [22].

Economic growth according to Jhingan[24] is the process whereby the real per capital income of a country increases over a long period of time, and is measured by the increase in the amount of goods and services produced in a country. A growing economy produces more goods and services in each successive time period. Thus in a wider perspective, it implies raising the standard of living of the people and reducing inequality of income distribution [25]. In the words of Zhattau [26] economic growth is the basis of increase prosperity and it comes from accumulation of more capital and innovations which lead to technical progress. This idea is similar to Solow growth model who sees economic growth in terms of growth in total GDP due to increase in population, technical progress and investment. Growth according to Classical Economist signifies increase in the rate of investment [27].

Economic growth is the increase in the quantity of goods and services produced in a country which raises her national income. He added that economic growth occurs whenever there is a quantitative increase in country's input and output over a period of time. Economic growth is a major step to economic development and economic growth leads to economic development. For this to exist, all the sectors of the economy must be growing and this must be sustainable [28]. Therefore, Economic development occurs when there are quantitative and qualitative improvement in all or almost all the sectors of the economy and which can be sustained.

Cole [7] noted that economic growth is the process by which the productive capacity of an economy increases over a given period, leading to a rise in the level of the national income. When there is economic growth is shows in the form of an increase in income level, an expansion in the labour, an increase in the total capital stock of the country, and a higher volume of trade and consumption. On the other hand, economic development is the process whereby the level of national production (national income) or per capita income increases over a period of time. The main purpose of economic development is to raise the standard of living and the general well-being of the people in an economy.

Furthermore, transportation is crucial to the survival and growth of the industrial sector as inputs, outputs, and human resources are moved from one place to another creating value for economic progress. In the 1960s and 1970s, road and rail transport systems were used alternatively (optimally) to transport goods in Nigeria. The use of the rail system was abandoned in the 80s resulting to lots of pressure on the roads and this led to a busy and quick depreciating road infrastructure, causing a lot of negative externalities in the form of

traffic, accidents, and pot holes, cracks and low productivity in the economy etc. Nigerian rail lines as at the year 2011 were 4,332 km, consisting of 3,505 routes km and 827 km of loop and siding lines [29], while Nigeria has 193,200 km of roads, made up of 34,123 km of federal roads, 30,500 km state roads and 129,577 local government roads

The key components of transport in focus are roads and road transport operators, railway and rail transport operations, airports and airlines, ports and shipping companies, inland waterways, and urban public transport. We can associate some public institutions with the provision and operation of services in these sectors, such as, for example, the Federal Ministry of Works, the Nigerian Railway Corporation, the Federal Airports Authority and the Nigerian Ports Authority. It is not so much the ownership and control of these modes that are in question as far as transport reforms are concerned, but the nature of competition needed to bring about both allocative and distributional efficiency in the transport sector. Much of the corporations that control the transport modes listed were considered to be natural monopolies with a sub-additive cost function, and the ability to operate cheaper than when there are many firms. The realization that the economies of scale or scope attributed to these public utilities can be transformed by unbundling the monopolies, and by separating the network from the users of the network, has considerably improved our understanding of the transport market, and the extent of restructuring that is possible, in terms of institutional framework and economic regulation [30].

Historical clarification on the Existing transport situation and their challenges

a) Road Transportation

It has been well documented that the history of road transport in Nigeria dates back to 1904 when Lord Luggard endeavored to construct a mule road linking Zaria and Zungeru both in the Northern part of Nigeria [10]. The road construction was later stretched from Zaria to Sokoto, Katsina and Maiduguri afterwards. Also, in 1906, the road linking Ibadan and Oyo was constructed and recorded to be the first motorable road ever constructed in Nigeria. In 1925, the Nigerian central government established a Road Board and eventually by 1926, H.E. Walker put up a skeleton trunk road system to link the major administrative centres in the country. In 1937/38, the total length of roads managed by the Nigerian government increased from 6,160 km (5,875 miles) in 1938/39 to 9,453 km (5,875 miles) [31]. However, the Nigerian landscape was indicated with a skeletal network of trunk roads, with secondary and feeders roads exhibiting the characteristics which reflected the purpose of their construction at independence in the year 1960. These roads were curving and narrow in nature as they were purposely used to facilitate the movement of agricultural produce from the interior parts to the ports for exports and also to serve as links among scattered human settlements, thereby permitting ease of administration.

More so, records from the Federal Office of Statistics (now Nigerian Bureau of Statistics) revealed that as at 1951, from the total number of 44,414 km of road in Nigeria, 1,782 km were surfaced, lacking in standard designs and single lane with sharp bend and poor drainage system, but between 1958 and 1980, the country's road immensely improved both in terms networks and lengths from 44,414 km in 1951 to 114,768 km in 1980, whereas tarred road also remarkably increased in length from 1,782 km in 1951 to 28,632 km in 1980, earth/gravel road increased from 4,232 km in 1951 to 86,136 km in 1980. In respect to investments in road development, several governments at different era in Nigeria have given precedence to road development and projects over the years. Notably, during the First National Development Plan (1962-1968), a total of N150.6 million was apportioned to road development, where the road subsector votes range from 7% in the then Western region to 25% in the Northern region and a national average of 11% for all estimated investments. Nevertheless, still on the aim of actualizing the rational allocation of scarce resources in Nigeria, the federal government allotted a total sum of N70.8 million to care for the essential road developmental projects on the basis of a system of priority rating. Furthermore, between 1970 and 1974, under the Second National Development Plan, a total investment of N2, 050.738 million was projected for road development, while total allocation to transport sector stood at N485.189 million. The target of the road development under this development plan was the rehabilitation of the roads that were adversely affected by the Nigerian civil war. The third National Development Plan budgeted total public investment of N32, 855.016 million, with the allocation for road transport amounted to N5, 430.436 million out of the N7, 303.068 million allocated to the transport sector, while represented 73.12% of transport sector and road transport as a percentage of all public investments amounted to 16.25% [23].

Under the Fourth National Development Plan (19811985), the sum of N7, 457.912 million was equally apportioned to road development from the total of N10, 706.616 million allocated to transport sector development. Despite various government past interventions to stimulate investments in the Nigeria's road development, the contribution of road transportation to gross domestic product has not lived up to expectation as the total contribution of road transportation to gross domestic product steadied around N6, 718.5 million amounting to 3.27% in 1981, but subsequently fell to N4, 852.3 million in 1991 representing 1.83% contribution to gross domestic product. This was further improved in 2001 when Nigerian government invested N6, 667.7

million resulting to 1.94% contribution to gross domestic product, but was further augmented to 2.03% representing a contribution of N8, 407.9 million to total gross domestic product[23].

Road transport is the dominant mode of transportation in Nigeria. It also presents the most complex situation in that the body that is responsible for the provision of the supporting infrastructure. The roads/highways- is not responsible for road transport operations, or the regulation of road transport. We should therefore distinguish between the road network and transport operators who use the network. Road transport operation is largely in the private sector. Its growth has, however, been encouraged through what is relatively a massive investment program on roads compared to investment in railways and inland waterways. It can therefore be argued that the road sector has taken advantage of the government's relative neglect of the other modes of transport to gain a competitive edge in the market.As a result of the predominance of road transport, 457 Nigeria's transport system is clearly imbalanced. Over 90 percent of internal goods and passengers aremoved by road. Current transportoperations are characterized by large-scalemovements of goods and passengers that could have been moved more costeffectivelyby other modes, such asrailways and inland waterways. Thepredominance of truck transportationaccounts for the excessive damage of theroad infrastructure and the attendant costimposition on the economy, estimatedrecently in the order of 21 billion Naira orUSD 156 million at 2008 prices, by BPEReport on Axle Load Study of Nigeria[32]. Some transport corridors are very heavily travelled, showing patterns of linkages that are strategic to planning and investments within the sector. Such corridors include: a) Lagos - Ibadan/Lagos-Shagamu; b) Lagos - Ibadan-Kaduna-Kano; c) Port Harcourt – Aba-Abuja-Kaduna-Kano; d) Lagos-Shagamu-Benin city; e) Benin- Lokoja-Abuja-Kaduna-Kano; f) Benin-ASaba- Onitsha; g) Port Harcourt-Aba-Enugu; h) Kano-Maiduguri- Ngala [30].

According to Botha and Filani [33] one of the major problems associated with the overreliance on road transport in Nigeria is illustrated by the dominant role played by the Lagos ports in Nigeria's foreign trade. Most of Nigeria's traffic still originates in Lagos as Lagos accounts for almost 90 per cent of containerized cargo through put (441,040 TEU). Also about 60 per cent of general dry and liquid cargoes are handled in Lagos. This accounts for the current congestion costs which are a significant burden on the economy of the nation. Average port calls are still longer for Lagos compared to other West African ports. The response of shipping lines is to impose steep congestion charges on all cargoes destined for Lagos (about $660/TEU at 2005 prices). Additional charges are imposed on cargoes destined for Apapa (about $ 108 at 2005 prices); with the result that port charges are over 35 per cent higher in the Lagos port complex than those of other West African states.

Other problems associated with the overconcentration on road transport include misallocation of bulk traffic which could have been carried by rail and inland waterways; low safety levels and poor service quality provision; lack of regulation of the industry; and a proliferation of enforcement agencies. In particular, the lack of axle load regulation seriously affects the ability of the railways to compete with road transport. It also contributes to road pavement damage in the country. Indeed, the BPE [34]Axle load study showed that 51.9% of the vehicles studied were overloaded and the average percentage overload per axle was 48.8 for the 5,563km of the Federal Roads. In view of the cost to the economy due to truck transportation and excessive axle loads, efforts must be made to actualize the road sector reforms, which will regulate the sector, revitalize rail links, and improve rail performance and logistics in the transport sector.

B) Railway Transportation

The Nigerian Railway started in 1898 with rail construction from Iddo to Otta, a distance of 32 kilometers and extended to Maiduguri between 1955 and November 1964. The track network was built essentially for the transportation of produce from the hinterland to the port during the colonial era. Before the 19th century, the single-track narrow network ran diagonally across the country, it was well able to haul all the agricultural products grown in the far north to the seaports at Lagos and Port Harcourt. The commercial quantity and contribution of groundnuts from Northern Nigeria, cocoa from Western Nigeria and palm oil from Eastern Nigeria, to the booming Nigerian economy at the time was a reminder of the good old railway era. Furthermore, development of the railways was abandoned in favour of road transport by successive Nigerian governments, while roads were expanded without any consideration of the attendant effects such as road traffic accidents, pollution, congestion, parking, etc. Some highways were constructed parallel to railway lines, resulting in competition rather than a complementary role between road and rail transport. The rail lines are just 4,332 km of loop and siding lines [29] and till now, Nigeria is yet to catch-up with the required rail lines let alone annexing the model technologies available in the rail sub.

The differences in railway and road transport contribution to GDP in Nigeria can speak volume of that. Road transport contributed N5, 085.2 million while the rail contributed N211.1 million to GDP in 1982, but in 2009 road contributed to GDP increased to N17, 551.4 million while rail contribution declined to N2.1 million. This must have resulted from the neglect of the rail sector and this trend still haunts railway development for effective commercial activities in the country. However, in the recent time, the Nigerian government is seriously reconnoitering the potentials of the rail transport system and has put in place strategic measures to resuscitate the dilapidated so Nigerian Railway Corporation (NRC). This is aimed at establishing well-grounded foundation

for modernization of the country's railways system and connects economic zones to major state capitals by the railway network to facilitate travel, commerce, regional development, national integration and intermodal activities. Presently, under the Nigerian Government 25 years Railway Strategic Vision, efforts have begun to implement the railway system Transition, Modernization and Stabilization activities. Also, other activities embedded in the strategic vision include the rehabilitation, restoration and reactivation of the existing narrow gauge lines and the procurement of 25 No C25 EMPD diesel locomotives and other equipment coupled with the construction of light rail networks in four cities and aimed to be extended to the six (6) geo-political zones in Nigeria [23].

The imbalance in modal share between rail and road transportation emerged after the 1960s. Up until then, the railway carried over 60% of the freight tonnage compared to its current share of less than 5%. The length of the network is 3,505km running from North-South. The basic characteristic is narrow gauge (1.067m) and single track. In the last twenty years until the recent initiatives for which data are not yet confirmed, the highest number of passengers carried was 15.5million in 1984 and the highest volume of freight was 2.4 million tonnes in 1977. By 2000/2001, traffic had fallen to 2million passengers and less than 300,000 tonnes of freight. The deterioration in the railways has been partly a result of insufficient budget provision by the Federal Government coupled with poor management by the monopoly operator, namely, the Nigerian Railway Corporation. In terms of infrastructure, locomotives and rolling stock are in very poor condition. In 2004, for example, 57.5 % of the wagon available were defective and could not be used, leaving only 36.6% in good working condition. The conditions of coaching stock and locomotive were also very poor resulting in reduced number of reliable service provided because of locomotive failures. In addition to lack of funding, uncoordinated purchases of equipment from different suppliers, and inconsistencies in human capacity development and use of management consultants, made interchange of parts impossible [30].

Yet the future of rail transportation in Nigeria is potentially bright. Nigeria is a large country and railway transport operation has a potentially good market in terms of both passenger and freight. The Nigerian railway network is the most appropriate mode of transport for the haulage of bulk load over long distances. It is also suitable for transporting goods to and from ports in response to the problems earlier discussed concerning road transport and ports in the Lagos port complex. There is under-investment in the rail sector. This is clearly illustrated when compared to the density of rail systems of other countries. A standard gauge line is being built tosupply the Ajaokuta steel company inAjaokuta. The section between Itakpe andAjaokuta has been completed and servesthe purpose of supplying Ajaokuta withiron ore while the Delta Steel Company inWarri will be supplied with iron ore superconcentrate when the Ajaokuta–Warriline is completed. Various bulk goods willbe traded between the two companies atAjaokuta and Warri. The Nigerian Railway Corporation hasbeen unable to maintain the existing track,locomotives and rolling stock, and thepermanent way is old and worn-out inmany parts. Attempts to revive therailways as a monopoly in the last twodecades have failed, thereby emphasizingthe need for reforms in the rail sectorfollowing global best practices [30].

In many countries, rail transportation has and continues to play a catalytic role in bringing about socioeconomic development. It contributes substantially to the movement of passengers and freight. Indeed, railways can provide the most cost-effective, affordable, energy saving and environmentally friendly form of transport, when traffic densities are high. When properly integrated with other modes of transport, economic levels of traffic can be consolidated to enable the railway provide efficient services for high density flows of homogenous traffic carried over relatively long distances, including high volumes of containerized cargo or bulk freight such as oil, coal, steel or agricultural produce. Rail transport could be energy flexible and energy efficient, when electric traction is used[10].

The Nigerian railway network consists of 3,505 kilometers of single track route of 1,067mm (narrow) gauge and 479 km of the standard gauge construction of 1,435mm (Ajaokuta-Warri line). It traverses from the South-West (Lagos) to the North-East (Maiduguri) and from the South-South (Port Harcourt) to the North-West (Kaura - Namoda). Equally, new railway lines are being constructed in standard gauge (1,435mm). These include: Ajaokuta - Warri of 277km; Kaduna - Abuja line of 186km while the scope of work for Lagos – Ibadan segment is under review together with its cost implications. The primary reason for constructing the railways was partly administrative: to provide a link between the northern and southern parts of Nigeria and partly economic: to enhance the evacuation of mineral resources and agricultural products from the hinterland to the seaports, for onward shipment to overseas markets in Europe [35].

At the moment, the NRC operates just one freight service from Lagos to Kano each week. Years of neglect of both the rolling stock and the right-of-way have seriously reduced the capacity and utility of the system. Couplings of the chopper kind, vacuum brakes and non-roller bearing plain axles are also obsolete. By early 2013, the only operational segment of Nigeria's rail network was between Lagos and Kano. Passenger trains took 31 hours to complete the journey at an average speed of 45 km/h. With Nigeria's increasing population rate and the majority of the population involved in intra and interstate trade, Nigerian rail transport can no longer provide effective and efficient means of transporting passengers and goods [35].

Several years after independence, Nigerian rail transport infrastructures investment still remains primary in Nigeria's transport system. While the maritime sector has been developed in terms of capacity and fair country-wide spread, the rail sector continues to be bogged down by systemic neglect. The railway well suited for the movement by large numbers of inter-city passengers and high volumes of containerized cargo or bulk freight such as oil, coal and steel or agricultural produce. Since the fall in the price of oil in the international market, it has been difficult for the nation to finance her rail transport infrastructures because Nigerian economy is mono-economy that depends majorly on one source of foreign exchange earnings [36]. The effects of the poor performance of the Nigerian railway subsector is already being felt seriously in the form of the undue pressure being mounted on the road transport across the country and the attendant huge damage to roads and loss of lives among other things. Many rail and road projects have been stopped due to the fall in oil revenue. This has led to low economic activities, decrease in productivity, increase in unemployment, low income, and high price level among others.

C Air Transportation

The history of air transportation development in Nigeria started from the period after World War II when flights were operated by the British Royal Air Force (RAF) between Britain and her colonies in West Africa. At the end of the war in 1945, the four British colonies in West Africa- Nigeria, Gold Coast (now Ghana), Sierra Leone and Gambia (now Banjul) joined together and established the West African Airways Corporation (WAAC) with its headquarters in Lagos to continue the link between these countries and between them and Britain [37]. When these countries became independent (Ghana in 1957 and Nigeria in 1960), WAAC was disbanded so that these independent countries could own their own national airlines. As soon as Nigeria became independent in 1960, the Federal government of Nigeria established the Nigerian Airways Limited as the national carrier, 100 per cent owned by the Nigerian Government. Right from its inception, the Federal Government of Nigeria spent huge amounts of capital on the development of air transportation. This led to importation of improved modern aircrafts (DC-3, F27, F28 and later Dc-8, Dc-10, Boeing 707, Boeing 737 and Boeing 474) into the country. Subsequent tremendous increase in air traffic in the country were well documented during this period [37]; [38].

The Nigerian Airways operated international flights to East and West Africa, parts of Europe, North America and Asia. It also enjoyed the monopoly of providing domestic air services in the country until the 1980's when increase in demand for air transport and public complaints about the shortcomings of the Nigerian Airways forced the government to permit the participation of private airlines in domestic aviation [39]. The National Civil Aviation Policy (NCAP) of 2001 formalized the deregulation and privatization of the aviation sector in Nigeria. Onokala[40] noted that the civil aviation sector in Nigeria has shifted from a purely public sector of the 1970's and 1980's to a liberalized sector with private sector participation in airline business, in line with the global trend. In fact, the last two decades in Nigeria has witnessed an enormous expansion in both domestic and international traffic but domestic traffic predominates and jumped from 5.2 million to 8.4 million between 2001 and 2007. The situation in Nigeria is similar to what is reported at the global level where the International Air Transport Association (IATA) reported world total domestic air passenger traffic of 1,249,000,000 in 2007 indicating 8 percent growth over the number for 2006 [41].

The air transport sector is largely deregulated with domestic airlines competing in the market, but it is not clear how much economic regulation of the sector is provided by the National Civil Aviation Authority whose main focus appears to be primarily on aviation safety. The reform in the sector should include as well the unbundling of the Federal Airport Authority of Nigeria to reflect the countervailing structure needed to guarantee autonomy or financial independence and to promote competition and fair trading among domestic airports. Approximately 78 airfields exist in Nigeria out of which 30 are privately owned and operated. The private airlines currently operating within Nigeria include Arik Airlines, Air Peace, Aero Contractors, Bellview Airlines, Associated Airlines, Capital Airlines, Overland Airlines, Chanchangi Airlines, among others. Several international airlines also operate in Nigeria. By international standards, the size of Nigeria's aviation sector is modest. The international airports are at Abuja, Lagos, Enugu, Port Harcourt and Kano whichare under the Federal Airports Authority of Nigeria (FAAN). These international airports in Nigeria serves both intercontinental and domestic destinations flights. Over the years, the number of airports in Nigeria, which are owned by the government, has steadily increased. Presently, Nigeria has 22 airports and many of them are currently being upgraded to international airports that can handle modern aircrafts. Due to its inherent advantage of speed in a situation where large spatial disparities occur in resource endowment and production as in Nigeria, the important and inevitable role of air transportation in the movement of people across the country has contributed a lot to the Nigeria's economic development [9]. It is worthy to note that Lagos, Abuja and Kano account for between 77- 90 per cent of passenger movements and 64 - 89 per cent of aircraft movements in Nigeria, while Lagos alone accounts for slightly over half of the international and domestic passengers carried. From an intermodal perspective, the major airports are well integrated with road infrastructure, and all access roads to airport have federal status. Land transport connections are, however, poor. Trips to airports are by cars,

taxis or hotel shuttle transport. There is no access to the airport by the conventional mode of public transport, namely, bus or rail.

Onokala [40] observed that due to improved economic conditions, Nigerians are willing to travel by air more than ever before. Bardi[42] studied the spatial structure and growth trend of domestic air passenger traffic in Nigeria. He confirmed that there has been a steady growth in domestic air passenger traffic in Nigeria and that the domestic air passenger network changed from partially connected networks in 2003 and 2006 to a Hub-and Spoke system in 2010 and 2014 as most airlines chose Lagos and Abuja as their centers of operation and their Hubs. The existence of these hubs indicate the maturity of the air transport network in the country.Therefore, the air transportation mode is growing at an alarming rate and has huge potential for the development of tourism in Nigeria. In fact, the airways transportation in Nigeria has a lot of room for expansion.

D) **Water Transportation**

The main ports in Nigeria are Lagos, Port Harcourt, Warri and Calabar. In the mid-1970sthese ports were overstretched as a result of oilboom and sharp increase in imports, resultingin ship handling and demurrage. Governmenthad made a massive investment that increasedport capacity by 300% between 1975 and1980. At present, the Nigerian Ports Authority(NPA) has 13 major ports under eight portmanagements, 11 oil terminals and 128 privatejetties within the port system. There are 102hard quay berths, 62 buoys and over 650different cargo types of handling plants andequipment. Put together, the port facilitieshave a total cargo handling capacity of over 35million tonnes.The ports mainly handle imports, rangingbetween 31.6% and 6.7% for general cargo,and 53.5% and 44.5% for bulk cargo, and23.6% and 22.6% for containerized traffic.Overall cargo throughput increased from 20million tonnes in 1998 to 30million tonnes in2000.The government has practically completed aprogram of concessioning the operation of the ports along with reforms in structure,institutional arrangements and operationalmodalities. The Nigerian Ports Authority hasbecome a landlord of the port system and BOTcontracts have been granted for portimprovements. Six inland container depots are also being constructed as BOT projects.These inland ports are:Isiala NGWA; Bauchi, Jos; Ibadan and Maiduguri[30].

Maritime transport is the shipment of goods (cargo) and people by sea and other waterways. No doubt, maritime transportation is a major conduit of international trade. Waterways are critically important to the transportation of people and goods throughout the world. The complex network of connections between coastal ports, inland ports, rail, air, and truck routes form a foundation of material economic wealth worldwide. Maritime transportation has always been the dominant support of global trade. More than 80% of world trade is carried out by sea. Maritime transportation is by far the cheapest mode of transportation globally [43]. Maritime transportation, similar to land and air modes, operates on its own space, which is at the same time geographical by its physical attributes, strategic by its control and commercial by its usage. While geographical considerations tend to be constant in time (with the exception of the seasonality of weather patterns); strategic and especially commercial considerations are much more dynamic. The geology of maritime transportation is composed of two major elements, which are rivers and oceans. Although they are connected, each represents a specific domain of maritime circulation. The notion of maritime transportation rests on the existence of regular itineraries, better known as maritime routes [44].

The most recent technological transformations affecting water transport have focused on modifying water channels (such as dredging port channels to higher depths), on increasing the size, the automation and the specialization of vessels (e.g. container ships, tanker, bulk carrier) and developing port terminal facilities to support the technical requirements of maritime transportation. These transformations partially explain the development of a maritime traffic that has been adapting to increasing energy demand (mainly fossil fuels), the movements of raw materials, location of major grain markets and last but not least to the growth of the trade of parts and finished goods. Modern ferries, cruise ships, and many types of recreational boats carry passengers for purposes ranging from daily business commuting to fishing to sightseeing. The ferry system in Halifax, Nova Scotia (Canada) exemplifies the importance of waterways for transportation [44].

2.2 Theoretical Literature

2.2.1 Balance Growth Theory

Every member of a society wants improvement in living standard, and so aspires for rise income from production, which is creation of utility. Conveying goods to the final consumer in many cases involves one form of transportation or the other. Improvement in transportation system is really a means of maintaining or advancing economic opportunities, better living and improved income within the economy. Members of a country and visitors have direct benefit in various types of transportation in operation within an economy [45]. Income generation and attainment of personal aspiration depends so much on transportation. Movement of inputs and outputs of production necessitates efficient transport system. Business cannot function effectively without sufficient means of transportation. Resources management, distribution, allocation and utilization involves functional transportation network [6].

Rodan [46] in his balance growth thesis discourages piece meal developmental strategy as inadequate to push an economy to the path of development and so postulated simultaneous and harmonious development of all the sectors of the economy due to linkages that brings about positive externalities in terms of use of resources, thereby promoting aggregate economic activity and economic development. In a similar vein, Rodan [47] in his Big Push theory stressed on the need for establishing minimum level of investment in industries and infrastructure as a necessary condition for development and growth. The two postulates require putting necessary infrastructure on ground in order to advance the course of societal improvement.

Ozoh [48] posited that the balance growth theory does not presupposes equal distribution of resources to all the sectors, rather a proportional allocation of resources capable of sustaining the required interdependence among sectors so as to have the presence of complementarily and externalities in the economies of scale among the various sectors, so as to secure optimum pattern of investment of resources. Adequate investment in the various components of transportation (road, rail, waterways and air) in Nigeria is a sine qua non for economic development.

Researchers have laid great emphasis on the indisputable role transportation plays in an economy and advocated for its proper positioning, adequate provision, accessibility and efficiency. Ladan [49] in his analysis of air transportation in Nigeria notes that efficient air transport is expected to convey people and commodities to their destination without any hitch, delay or cancellation and that a well functional air transport contributes significantly to economic growth and development. But regrettably, Nigeria suffers poor reputation for operation and safety, which stemmed from absence of coherent air transport policy, bad management, decaying facilities, closure of airports and occasional air crash, among others. This is a critical factor in our aviation industry. The high demand of air transport in recent time has not been matched with supply, hence, there is high pressure on the use of road transport, which brought about many deaths due to poor roads and congestion of vehicles.

2.2.2 The Endogenous Growth Theory or the Neoclassical Growth Theory

The neoclassical growth theory emphasized that economic growth results from increasing returns to the use of labour and capital holding technological advancement momentarily constant. The neoclassical production function of Cobb-Gouglas (1928) expressed the technical relationship between given level of output and a given quantity of physical input, that a change in output ia as a result of variation in the physical inputs. This production function has only two factors inputs in production but with the emergence of empirical evidence identifying electricity as an independent factor of production [50].

The theory states that if a firm or an economy which invests in capital (physical) and skilled workers adapts a new technology outlay for production, then productivity will be more effective. This will further leads to a shift in the production function and this can also lead to an increasing returns to investment rather than decreasing returns to investment. This implies that technology is endogenous to production system. The basic assumption of the theory is that labour and capital contributes to the long-run growth rate of an economy. In other words, physical capital and skills of labour are the two vital factors of production [51].

Endogenous growth theory describe economic growth which is generated by factors within the production process such as economies of scale, increasing return or induced technological changes, government policies, political stability, market distortions, human capital etc., can significantly affect economic growth as opposed to exogenous factors such as increase in population. Endogenous growth theory is a widely used growth model in providing a systematic investigation of the government policies and programmes. The exogenous growth theory, also known as the neo-classical growth theory as reported bySolow [52] which is the centre piece of the standard neoclassical growth model developed by Solow is an aggregate production function of the form:

$$Y_t = f(K_t, L_t, A_t) \quad (1)$$

According to Solow [52] Y represent output, K equals capital, L is labour and A is an index of technology or efficiency while t represent time trend. Solow posits that f has the usual neoclassical properties; in particular, it is characterized by constant returns to scale, decreasing returns to each input, and a positive and constant elasticity of substitution. The fundamental dynamic equation of the model relates the evolution of the capital stock to a constant rate of saving and a constant rate of depreciation. Labour and the level of technology grow at exogenous exponential rates. This model assumes that countries use their resources efficiently and that there are diminishing returns to capital as labour increases. From these two premises, the neo-classical model makes three important predictions; first, increasing capital relatives to labour creates economic growth, since people can be more productive given more capital. Second, poor countries with less capital per person will grow faster because each investment in capital will produce a higher return than rich countries with ample capital. Third, because of diminishing returns to capital, economies will eventually reach a point at which no new increase in capital will create economic growth. This point is called a steady state. If there were no technological progress, growth in this model would eventually come to a halt. However, the formulation of the model is

chosen so as to allow increases in efficiency to offset the diminishing returns to capital. In endogenous growth theory, the growth rate depended on one variable: the rate of return on capital [53].

2.3 Empirical Literature

Herranz-Loncán [54] examined the role of railways in export-led growth of Uruguayan economy between 1970 and 2010 using OLS estimation. The results showed that Uruguayan railways did produce some positive effects. They helped to integrate the national market while also promoting the political and administrative unification of the country. However, their economic impact was much lower than in other countries of the region that experienced export-led growth. This indeed has affected the growth prospects of the Uruguayan economy. The results, therefore, provide reason for relative poor performance of the economy during the period under study. The study concluded that Uruguayan case provides a clear-cut example in which geography limited the potential of railway technology to generate significant levels of economic growth.

Oyesiku, Onakoya and Folawewo[11] investigated the impact of public sector investment in transport on economic growth using Nigeria as a case study. The empirical model for the study was developed from the endogenous growth framework in which transport investment entered into the production function as input, using the Ordinary Least Squares (OLS) estimation technique and time series properties tests conducted on variables. Data for the study covered from 1977 to 2009. The findings showed that transportation played an insignificant role in the determination of economic growth in Nigeria. An increase in public funding and complete overhauling of the transportation system in the country were recommended.

Apanisile and Akinlo [55] examined the link between rail transport and economic growth in Nigeria over the period 1970-2011 using Error Correction modeling approach. The economic variables used were; GDP, capital, government expenditure on rail, rail and pipeline output and inflation. The results showed that there is long-run relationship among the variables. In addition, the ECM models showed that the error correction term is correctly signed and significant while there is inverse relationship between rail transport and economic growth in Nigeria. There is negative relationship between inflation and economic growth in Nigeria over the period under review. This explained the decadence in the sector due to the neglect of the sector by the government. The study therefore concluded that government should embark on development policies that will aim at strengthening the sub-sector of the economy so that it can operate in its full capacity and neutralize the decadence that is evident in the sector.

Uma, Ogbonna and Hyacinth [6] examined the effect of transportation network in Nigeria over the years using subsector output time series data (road transport (RT), rail transport (RW), air transport (AW) and water way (WW) ranging from 1981-2009 on the application of Johansen co-integration test and the Ordinary Least Squares (OLS) methodology. The results of the Johansen rank co-integration test revealed the existence of a long-run relationship between road transport, rail transport, air transport, water way and real gross domestic product (RGDP). The ordinary least squares results showed that only road transport significantly influence economic growth in Nigeria while all the coefficient of the explanatory variables (RT, RW&AW) met their expected signs as they impacted positively on real gross domestic product except output of water way(WW) which had negative impact. However, the joint effect of the variables on the economy was statistical significant based on the F-statistic. They recommended among others, that sufficient and consistent resources should be budgeted and allocated to transportation capital expenditure, while private domestic and foreign investors can be contracted to establish transport infrastructure and given a period of time to recoup cost of investment and profit margin.

Lingaitisa and Sinkevičiusb [56] studied the relations between the passenger transport by railway and macroeconomic processes of a country (region), the correlation and regression statistical analysis of people's income, consumption, motorization, change in population, unemployment and passenger circulation were used. The 2001–2012 statistical research indicators for Lithuania were used. The result shown that, due to the increased motorization as a result of the growing standard of living, the amount of railway passengers is decreasing, negative–reverse correlation coefficients between the passenger transport and the indicators of GDP, average wage and final consumption expenditures were found. Also close correlation of the passenger transport and the change in population were recorded.

Otu and James [14] investigated transportation, investment and economic growth in Nigeria using two research hypotheses to examine the relationship between transport investment and economic growth in Nigeria and transport investment and employment generation in Nigeria. Data for the study were collected from the Central Bank of Nigeria (CBN) Statistical Bulletin of various issues. Data collected were analyzed using ordinary least square estimation technique. Result revealed that there a positive relationship between air transport, road transport and water transport systems and economic growth in Nigeria. However, contrary to expectation, rail transport was negatively related to economic growth in Nigeria. Also the statistical tests conducted on the model showed that air transport and road transport systems are statistically significant at 5% level of significance. On the other hand rail transport and water transport systems were not statistically significant in influencing economic growth in Nigeria. The estimated results of the unemployment – transport

investment model showed that all explanatory variables have their correct expected signs. According to the results, domestic investment, inflation and transport investment all have negative impact on unemployment as expected, while interest is correctly signed with positive coefficient. The study recommended that funding of the sector by the federal government. Also, investment in the sector should be increased and modern rail system be built as obtained in advanced countries.

Ojekunle [57] assessed the commercial viability of rail transport operations in Nigeria. The data collected were analyzed using both descriptive statistics and regression analysis (SPSS Version 20). The results of data analysis showed that rail transport operations presently are not commercially viable. The variables used were volume of passenger, freight carried, Operating cost, Number of trips, Number of locomotives/wagons and coaches available. The results of the regression analysis shows that operating cost, number of trips made the capacity of train service and volume of freight carried were major determinants of estimating revenue generated from passenger operation. The variables account for 90.2% of the factors that determine the amount of revenue generated from freight operations of rail transportation in Nigeria. The NRC ran its operation at an average annual loss of 58.3% for passenger operation and 32.8% for freight operation. However, it is revealed that increase in the operational capacity of NRC will enhance the commercial viability of rail services in the country. It is therefore suggested that rail operational capacity should be increased by providing more locomotives, wagons, coaches and improving its operational efficiency.

Siyan, Eremionkhaleand Makwe [58] examined the impact of road transportation on economic growth in Nigeria. Both primary and secondary data were used as sources of data. Probit model was used to analyze the primary data while multivariate model was used for analyzing the secondary data to determine the long run relationship between growth and road transportation in Nigeria. The results showed that the transport sector had positive impact on the economic growth in Nigeria. Based on the findings, it was suggested that government should come up with sustainable and implementable road development and maintenance policies that will ensure good access and flow in Nigeria. Also, economic growth in Nigeria depended on the level of good and accessible road transportation that facilitates business activities in the country.

Clinton, Oluwaseun and Zomatic[23] examined the effects of road and rail transport system on economic growth of Nigeria. The empirical analysis and findings from a Multiple Ordinary Least Square (MOLS) model revealed that though road transport had significant and positive effects on economic activities, the low level of rail transport significantly suppressed the overall contribution of land transport and the smooth flow of goods and passengers in Nigeria. Consequently, the low level of rail system reduced the overall impact of transport sector on the growth of Nigerian economy, while government transport infrastructure investment enhanced the economic growth. The study concluded that the neglect of rail system had overstressed the road transport and hence destroyed the possible complementary benefits from the two transport system. They recommended that increasing government investment in rail transport sector will not only augment the overall economic productivity but also enhance the complementary contributions of both rail and road transport system in Nigeria.

Onokala and Olajide[9] analyzed the current problems and challenges facing the four major modes of transportation in Nigeria, which affect their continued contribution to the economic development of the country in the 21st Century as well as their prospects for further development in the future. Presently, the movement of people and all types of goods all over the country is handled by road transport, while roads are overused and also wrongly used in Nigeria the waterways have a lot of capacity that is not being utilized. In addition, pipelines are no longer used and petroleum product are now moved the already congested roads so pipeline are not discussed separately. It was revealed that roads are overused and also wrongly used in Nigeria while the waterways have a lot of capacity that is not being utilized. Railways were heavily used in the past but sparingly used now, while the airways are heavily used but still need a lot of improvement and expansion. The major result of the predominant use of road transportation over all the other modes are environmental problems of road transportation and high frequency of road traffic accidents on Nigerian roads. The problem of inefficiencies at the ports of Nigeria has led to missed opportunities for receiving more imports at the Nigerian seaports from other countries as well as transport to the economic development of the country. The study suggested sustainable ways of handling these problems and challenges so that these modes can continue their contributions to the economic development of Nigeria in the 21st Century. A lot of improvement and expansion is still needed as all these problems adversely affects the contributions of these modes of transport to the economic development of the country.

Adegoriola, Siyan and Wafure [10] investigated the impact of rail freight and passengers volume on economic growth in Nigeria on annual time series data from 1970 to 2017 sourced from Nigerian Railway Corporation, Federal Ministry of Transport, Central Bank of Nigeria and National Bureau of Statistics on the application of the Johansen co-integration and Error Correction Model (ECM). The results showed that a long-run equilibrium relationship between the key variables, Gross Domestic Product (GDP), Volume of Freight (VOF) and Volume of Passengers (VOP). ECM also revealed the expected negative sign and between the accepted region of less than unity. The result showed VOP had positive relationship with GDP but insignificant

impact on GDP. VOF had negative relationship but significant impact on GDP. The negative impact of VOF on economic growth can be attributed to total neglect of railway sub-sector in Nigeria by successive government. The study therefore recommended that government should continue to increase capital expenditure in the rail sub-sector in order to rehabilitate old and provide modern rail tracks, purchase modern coaches and locomotives will aid movement of passengers and goods across cities and the hinterland which will boost economic activities, increase output, facilitate trade and generate employment across the country.

III. Research Methods

3.1 Theoretical Framework

The Endogenous Growth Theory or the Neoclassical Growth Theory

The framework of this study assumes a standard neoclassical production function which premise on changes in quantities of factors of production account for growth. The neo-classical model is based on the Cobb-Douglas production function and is given as:

$$Y = f(A_t, K_t, L_t) \quad (2)$$

The neoclassical growth theory states that the changes in quantities of factor inputs in production (capital and labour) account for growth of output [51]. Where: Y = Aggregate real output, K = Capital, L = Labour force, A = Level of technology and t = time dimension.

3.2 Model Specifications

The specification of this study is based onthe CBN [13] means of transportation in Nigeria,and the adopted model is presented as follows:

$$RGDP = f(RDTP, RLTP, WRTP, ARTP, TPSS, PTCS) \quad (3)$$

The log linear form of Equation 3 is presented as equation 4

$$\ln RGDP_t = \beta_0 + \beta_1 InRDTP_t + \beta_2 InRLTP_t + \beta_3 InWRTP_t + \beta_4 InARTP_t + \beta_5 TPSS_t + \beta_6 InPTCS_t + U_t \quad (4)$$

(Apriori expectation $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and $\beta_6 > 0$).

Where, lnRGDP = log of real gross domestic product, InRDTP = log of road transport, InRLTP = log of rail transport and pipelines, InWRTP = log of water transport, InARTP log of air transport, InTPSS = log of transport services, InPTCS = log of post and courier services, U_t = Disturbance term or error term, β_0 = Intercept, $\beta_1 – \beta_6$ = Coefficient of the independent variables and t is the time trend.

The error correction specification of equation 4 is presented as equations 5:

$$\Delta \ln RGDP_t = \beta_0 + \beta_1 \Delta InRDTP_t + \beta_2 \Delta InRLTP_t + \beta_3 \Delta InWRTP_t + \beta_4 \Delta InARTP_t + \beta_5 \Delta TPSS_t + \beta_6 \Delta InPTCS_t + \beta_8 ECM_{t-1} + U_t \quad (5)$$

The ECM in equation 5 is the error correction mechanism which indicates the speed of adjustment to equilibrium whenever disequilibrium occurs in the transportation system in Nigeria.

3.3 Sources of Data and Variables Description

The economic and Transportation annual time series data from 1981 to 2019 used in this study were obtained from secondary sources. Specifically, data from Central Bank of Nigeria Statistical Bulletin [13].

3.4 Method of Data Analysis

This study used the Phillips-Perron test statistics, Johansen Cointegration techniques, Pairwise Granger Causality techniques and the error correction mechanism on a multiple regression framework. These techniques used in analyzing the data collected for this research are basically statistical and econometric in nature. The Phillips-Perron test statistics was used to determine the unit root stationarity test. Statistical theory requires that variables be stationary before application of standard econometric techniques. This was done in order to avoid spurious (misleading) results. The Johansen cointegration test was also employed to determines the existence or otherwise of a long run relationship among the variables in the models. The error correction model was thereafter estimated to determine the speed of adjustment to long run equilibrium. Diagnostic and stability tests were also conducted to confirm the robustness of the model.Finally, the Pairwise Granger Causality test was employed to examine the existence of causal relationships between transportation and economic growth in Nigeria

IV. Data Presentation, Analysis and Discussion of Results

The economic and electricity time series data used in this analysis are in Appendix A.

4.1. Unit Root Test Results

Prior to the estimation of ECM, a unit root test was conducted on the selected economic and transportation Indicators (Real gross domestic product (RGDP), Road transport (RDTP), Rail transport and pipelines (RLTP), Water transport (WRTP), Air transport (ARTP), Transport services (TPSS), Post and courier

services (PTCS) to determine their stationarity status. The results of the Phillips-Perronunit root test statistics are displayed in Table 1.

Table 1: Phillips-PerronUnit Root Test Results

Variable	Level	First Difference	Order of Integration
RGDP	0.461609(0.9989)	-3.390329(0.0113)	I(1)
RDTP	7.688537 (0.1000)	8.960934(0.0000)	I(1)
RLTP	-1.759283(0.3943)	-6.732548(0.0000)	I(1)
WRTP	4.443107(0.0318)	-7.184156(0.0000)	I(0)
ARTP	1.067193 (1.0000)	3.533775(0.0285)	I(1)
TPSS	2.975718 (0.0379)	5.654417 (0.0000)	I(0)
PTCS	1.895969 (1.0000)	-4.553027 (0.0013)	I(1)
5%CV	-2.941145	-2.943427	

Source: Author Regression Output from EViews 9.

Note: i. Pro-value are reported in parenthesis, ii. The Phillips-Perron statistics are compared to 5 per cent critical value (C.V).

The results of the Phillips-Perron test statistics in Table 1 showed that all the selected variables (RGDP, RDTP, RLTP, ARTP and PTCS) were stationary at first difference I(1) except WRTP and TPSS which were stationary at level I(0). This implies that the hypothesis of non-stationarity is rejected for all the variables at level and first difference respectively.

4.2 Cointegration Test using the Johansen Methodology

The results of the Unrestricted Cointegration Rank test for the model is presented in Table 2. Starting with the null hypothesis that there are no cointegrating vector (r = 0) in the model.

Table 2: Unrestricted Cointegration Rank Test result for model.

Hypothesised No. of CE(s)	Trace Stat.	Critical Value (0.05)	Prob**	Hypothesised No. of CE(s)	Max-Eigen Stat.	Critical Value (0.05)	Prob**
None *	188.1192	125.6154	0.0000	None *	68.77134	46.23142	0.0001
At most 1 *	119.3479	95.75366	0.0005	At most 1 *	55.30473	40.07757	0.0005
At most 2	64.04315	69.81889	0.1325	At most 2	27.61635	33.87687	0.2318
At most 3	36.42680	47.85613	0.3751	At most 3	14.52023	27.58434	0.7851
At most 4	21.90657	29.79707	0.3037	At most 4	13.00348	21.13162	0.4519
At most 5	8.903088	15.49471	0.3744	At most 5	8.206867	14.26460	0.3580
At most 6	0.696221	3.841466	0.4041	At most 6	0.696221	3.841466	0.4041

Source: Author Unrestricted Cointegration Rank Test Output from EViews 9.

Note: i. r represents number of cointegrating vectors. ii. Both Trace and Max Eigenvalue tests indicates 2 cointegrating equations respectively at the 0.05 level. iii. *****denotes rejection of the hypothesis at the 0.05 level and iv. ****** Mackinnon-Haug-Michelis (1999) p-values.

4.3 Short-run Error Correction Representation

The results of the short-run error correction representation for the model is reported in Table 3.The short run error correction mechanism results presented in Table 3 showed that the entire explanatory economic and transportation variables in the estimation met their expected signs except water transport and transport services. The empirical results also revealed that road transport (RDTP), air transport (ARTP) and post and courier services (PTCS) had direct and significant contributions to real gross domestic product (RGDP) in Nigeria for the sample period. This means that 1 per cent increase in road transport, air transport and post and courier servicesincreased real gross domestic product in Nigeria by 36.0, 15.8 and 72.6 per cent respectively.These finding supports the work of Otu and James [14].

Table 3: Short-run Error Correction Representation for the Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.647158	0.190420	3.398583	0.0024
D(InRDTP)	0.359697	0.083093	4.328828	0.0002
D(InRLTP)	0.154752	0.089796	1.723374	0.0977
D(InWRTP)	-0.312410	0.112792	-2.769790	0.0106
D(InARTP	0.157634	0.050699	3.109177	0.0048
D(InTPSS)	-0.255262	0.095178	-2.681931	0.0130
D(InPTCS)	0.726148	0.211093	3.439945	0.0021
ECM(-1)	-0.212333	0.089923	-2.361286	0.0267

Source: Author Regression Output from EViews 9.

The study also found that rail transport and pipelines (RLTP) crowds-in real gross domestic product in Nigeria (RGDP) with an insignificant positive growth effect. This implies that a unit change in rail transport and pipelines crowds-inreal gross domestic product in Nigeria by 15.5 per cent approximately.This result agreed with the previous empirical analysis ofUma, Ogbonnaand Hyacinth [6].

The results further revealed that water transport (WRTP) and transport services (TPSS)had inverse relationship with real gross domestic product (RGDP) in Nigeria.Thus, 1 per cent change in water transport and transport servicesdiscouraged growth by 31.2 and 0.25.5 per cent respectively, due to crowding out effect.These result is consistent with the previous studies ofUma, Ogbonnaand Hyacinth [6].

Finally, The error correction mechanism ecm(-) of -0.212333is statistically significant and have the appropriate sign . It suggest however, that there is a very low adjustment process in the activities of the transportation sector in Nigeria since the speed of adjustment to the longrun equilibrium is 21.2per cent.

4.4 Diagnostic Test

To confirm the robustness of the model, a diagnostic test was performed as shown in Table 4.

Table 4: Key Regression and Diagnostic Statistics for Model

R-squared	0.635829	Mean dependent var	1.498773
Adjusted R-squared	0.587946	S.D. dependent var	1.480947
S.E. of regression	681.9656	Akaike info criterion	16.10015
Sum squared resid	1116.185	Schwarz criterion	16.46659
Log likelihood	-249.6025	Hannan-Quinn criter.	16.22162
F-statistic	17.45562	Durbin-Watson stat	1.967502
Prob(F-statistic)	0.000000		

Source: Author Regression Output from EViews 9.

The coefficient of determination R^2 indicates that 63.6 per cent of the total variation of the real gross domestic product in Nigeria is jointly explained by road transport, rail transport and pipelines, water transport, air transport, transport services, post and courier services. The Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion shows that the model is correctly specified. F statistic measuring the joint significant of all regressors in the model is statistically significant at the 5 per cent level. Durbin-Watson statistic is 1.967502. This implies absence of autocorrelation among the explanatory variables.

4.5. Stability Test

Stability test was performed for the model using cumulative sum (CUSUM) and cumulative sum of square (CUSUM Q) of recursive residuals as shown in figures 1 and 2 respectively. The existence of parameter instability is established for the model if the cumulative sum of the residual goes outside the area between the critical (straight bounded upper and lower) lines.

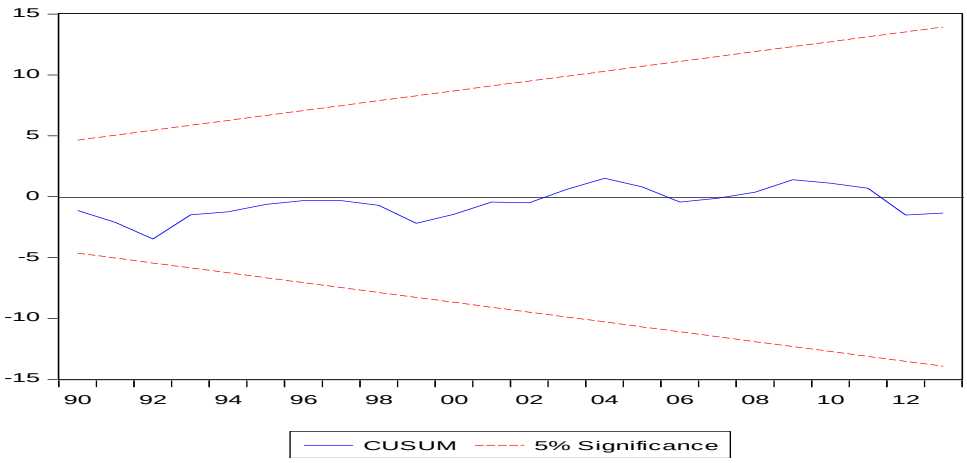

Figure 1 Plot of Cumulative Sum of Recursive Residuals

From figure 2 and 3, it was observed that the model at 5 per cent level of significance, CUSUM and CUSUM Q were both stable because the observed bound lied between the upper and lower limit. In conclusion, at 5 per cent critical value both CUSUM and CUSUM Q explain the stability of the model overtime.

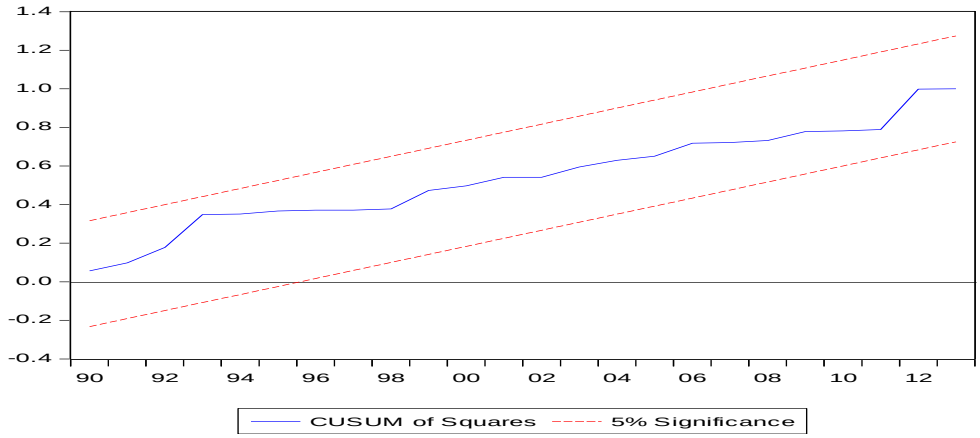

Figure 2 Cumulative Sum of Square of Recursive Residuals

4.6. Granger Causality Test Results

The Pairwise Granger Causality test was employed to examine the existence of causal relationships between transport sector and economic growth in Nigeria, and the results of the estimation are reported in Table 5.

Table 5: Pairwise Granger Causality Test Results for the Model

Null Hypothesis:	Obs	F-Statistic	Prob.
RDTP does not Granger Cause RGDP	37	0.65409	0.5267
RGDP does not Granger Cause RDTP		16.4930	1.E-05
RLTP does not Granger Cause RGDP	37	1.63448	0.2109
RGDP does not Granger Cause RLTP		0.69370	0.5071
WRTP does not Granger Cause RGDP	37	3.21764	0.0533
RGDP does not Granger Cause WRTP		9.19635	0.0007
ARTP does not Granger Cause RGDP	37	0.94461	0.3994
RGDP does not Granger Cause ARTP		0.45762	0.6369
TPSS does not Granger Cause RGDP	37	0.95702	0.3948
RGDP does not Granger Cause TPSS		7.98301	0.0015
PTCS does not Granger Cause RGDP	31	1.06720	0.3586
RGDP does not Granger Cause PTCS		2.62354	0.0916

Source: Author Regression Output from EViews 9.

The test for the null hypothesis of no causation betweenroad transport (RDTP) and real gross domestic Product (RGDP); rail transport and pipelines(RLTP) and RGDP; air transport (ARTP) and RGDP; post and courier services (PTCS) and RGDP were accepted as their pro-values were greater than 0.05 (P > 0.05). This implies no evidence of causation between RDTPand RGDP, RLTPand RGDP, ARTPand RGDP, PTCS and RGDP during the period.

Finally, the causality between water transport (WRTP) and RGDP; transport services (TPSS) and RGDPin Nigeria exhibited unidirectional causation as their pro-values are less than 0.05(P<0.05). Thus, the null hypothesis of no causation was rejected as the feedback causation phenomenon was evident. This findings is in agreement with the works of Pradhan [59].

V. Concluding Remarks

In reviewing the contributions of transport sectorto economic growth in Nigeria between 1981 and 2019, one can deduce from the findings that the direct and significant impact of road transport (RDTP), air transport (ARTP) and post and courier services (PTCS)on real gross domestic product (RGDP) in Nigeria, is as a result of the heavy utilization of these means of transportation in Nigeria. The study further revealed that water

transport (WRTP) and transport services (TPSS)had inverse relationship with real gross domestic product in Nigeria due to their crowding out effect.The results of the Phillips-Perron test statistics showed that all the selected variables (RGDP, RDTP, RLTP, ARTPand PTCS) were stationary at first difference I(1) except WRTP and TPSS, while the error correction mechanism ecm(-) of 21.2 per cent approximatelyshowed a very low adjustment process in the activities of the transportation sector in Nigeria since the speed of adjustment to the longrun equilibrium is below 50 per cent. It is also a confirmation that indeed road transport, rail transport and pipelines, water transport, air transport, transport services, post and courier services and the real gross domestic product in Nigeria are cointegrated. It was also revealed that at 5 per cent critical value both CUSUM and CUSUM Q explain the stability of the model overtime. While, the causality between water transport (WRTP) and RGDP; transport services (TPSS) and RGDPin Nigeria exhibited unidirectional causation during the period.

Based on the empirical findings of the study, the following recommendations were made:

a) The regulatory authorities of the ministry of transportation should strengthen policy on the maintenance and renovation of transport facilities, as well as overhauling of the entire transport infrastructural development in Nigeria, to meet up with the increasing demand of transportation services and sustain economic growth in Nigeria.

b) The waterways and rail transport have a lot of capacity that are yet utilized. Therefore, government should urgently increasethe facilities of the water transport system by implementing the rail and waterways master plans to sustain economic growth as well as to attract positive development in the inland and sea waterways communities in Nigeria.

c) Special attention should be geared towards the actualization of the federal and states highway dualization of road in Nigeria, as this will help to reduce the pressure on the road transport system. In addition, rail transportand pipelines should be resuscitated to covey large or heavyweight goods, as this will further reduce the trucks and tankers on the already congested roads in Nigeria.

d) Government should budget more to finance road, air and rail transport as these will not only augment the overall economic productivity but also enhance the complementary contributions of these transport system to economic growth in Nigeria.

e) The problem of inefficiencies at the few ports available in Nigeria should be addressed by creating more seaport to match opportunities for receiving more importations.

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Appendix A: Economic and Transportation Data for Regression Analysis

Year	RGDP	RDTP	RLTP	WRTP	ARTP	TPSS	PTCS
1981	15,258.00	2.91	1.11	0.73	0.69	0.08	0.80
1982	14,985.08	2.38	1.28	0.91	0.91	0.08	0.89
1983	13,849.73	2.32	1.10	1.03	0.90	0.10	0.88
1984	13,779.26	2.61	1.09	0.85	0.94	0.11	0.77
1985	14,953.91	3.78	1.31	0.79	1.10	0.10	0.85
1986	15,237.99	3.96	1.38	0.83	1.02	0.11	0.87
1987	15,263.93	4.28	0.94	0.88	1.11	0.12	0.88
1988	16,215.37	4.63	0.80	0.97	1.17	0.13	0.92
1989	17,294.68	5.02	0.59	0.86	1.18	0.14	0.94
1990	19,305.63	5.83	0.60	0.88	1.38	0.16	0.96
1991	19,199.06	6.61	0.59	1.04	1.41	0.18	0.97
1992	19,620.19	10.05	0.43	0.98	1.93	0.23	1.29
1993	19,927.99	16.92	0.59	1.44	2.82	0.38	1.99
1994	19,979.12	37.25	0.03	1.36	3.81	0.94	2.02
1995	20,353.20	58.31	0.02	1.57	4.64	1.99	2.17
1996	21,177.92	75.71	0.03	1.78	5.26	2.96	2.37
1997	21,789.10	87.02	0.04	2.00	6.37	3.67	2.57
1998	22,332.87	112.48	0.04	2.09	6.82	4.95	2.81
1999	22,449.41	132.65	0.04	2.19	7.69	7.14	3.14
2000	23,688.28	145.29	0.04	2.38	9.20	9.00	3.57
2001	25,267.54	162.31	0.05	2.61	10.53	10.40	4.07
2002	28,957.71	200.67	0.05	2.59	14.03	12.85	4.64
2003	31,709.45	232.78	0.06	2.63	15.37	13.36	5.30
2004	35,020.55	270.02	0.06	2.84	16.79	14.71	6.04
2005	37,474.95	313.22	0.07	3.07	18.29	16.20	6.88
2006	39,995.50	363.34	0.08	3.31	22.41	17.85	7.85
2007	42,922.41	421.47	0.08	3.51	25.44	18.93	8.94
2008	46,012.52	488.91	0.09	3.70	25.75	20.02	10.20
2009	49,856.10	567.13	0.09	3.90	29.20	21.18	11.62
2010	54,612.26	619.14	0.11	4.23	32.67	22.65	15.98
2011	57,511.04	670.80	0.14	5.04	56.49	30.01	16.86
2012	59,929.89	784.81	0.19	5.57	65.61	42.18	18.96
2013	63,218.72	893.13	0.22	6.22	76.91	53.05	21.69
2014	67,152.79	1,017.16	0.25	7.15	84.41	63.55	24.92
2015	69,023.93	1,156.29	0.28	8.07	95.74	72.95	27.73
2016	67,931.24	1,358.68	0.31	8.92	94.50	82.25	28.86
2017	68,490.98	1,564.81	0.33	9.43	105.86	86.43	20.63
2018	69,799.94	2,058.94	0.34	9.86	149.35	89.01	20.87
2019	71,387.83	2,727.53	0.36	10.12	198.62	93.53	22.41

Sources: CBN Statistical Bulletin, (2019).

Note: All the variables were estimated in Billion Naira (₦Billion).

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