IMPACT OF TRANSPORTATION SECTOR ON ECONOMIC GROWTH IN NIGERIA (1970-2019)

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CERTIFICATION

I certify that this research project was conducted under my supervision by Daodu Precious Damilola (17020301013) at the department of Economics, Mountain Top University, Ibafo, Ogun State, Nigeria.

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DEDICATION

This project is dedicated to the Almighty God who helped me attain this academic position and He helped me through the completion of this project. I also dedicate this project to my family who encouraged me through the process of this research.

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I give glory to the Almighty God who has made the completion of this project possible because without Him it will never be possible for me to do this. Thank you Father, Son and Holy Spirit.

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ABSTRACT

This study examined the impact of transportation on economic growth in Nigeria. In furtherance, it analyzed the growth implication of road transportation and the impact of railway transportation on economic growth as well as the effect of airway transportation on economic growth and the impact of waterway transportation in Nigeria.

The study made use of annual time series secondary data. Data on real GDP, railway transportation, airway transportation, government expenditure, capital utilization, population, foreign direct investment, interest rate, exchange rate and inflation rate were sourced from the World Development Indicators (WDI). Road transportation was sourced from Transportation Index Database (TRID Database). Waterway transportation is gotten from National Bureau of Statistics (NBS) while investment rate is sourced from Central Bank of Nigeria (CBN) Statistical Bulletin. The data collected were analysed using tables and econometric techniques, particularly the Autoregressive Descriptive Lag (ARDL) model. The analysis performed are unit root test, using both Augmented Dickey-Fuller (ADF) and Phillip Perron (PP), the lag order of ARDL models using VAR, lag order selection criteria and bound test.

From the results obtained in the study, it was discovered that road transportation (ROT) has an insignificant but positive relationship with real GDP while railway transportation (RAT) has a significant but negative relationship with real GDP in Nigeria. However, airway transportation (AIT) has an insignificant but negative relationship with real GDP while waterway transportation (WAT) has a negative but statistically insignificant relationship with RGDP in Nigeria.

The study concluded that, of all transportation sector examined in this research, only road transportation has positive but insignificant impact on economic growth in Nigeria. Corruption in road contracts, lack of monitoring of contracts awarded, governance of road construction, among others were major hindrances to improvement of road transportation in Nigeria. However, for road

transportation to have a significant impact on economic growth, the government should increase investment. Road pricing strategy should be adopted in Nigeria because of its benefit of demand for road transportation. The government should also reduce transportation costs, minimize congestion and overcrowding, improve reliability and deliver benefits to the wider economy.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Many academics have recently acknowledged transportation as not only a significant economic growth facilitator, but also as the backbone of many industrialized countries' economic growth activities (Bagchi and Pradhan, 2013). The availability of a dependable and effective transportation system is regarded as one of the essential variables that influence a region's economic prosperity. This is primarily because a well-developed transportation system offers enough access to the region, which is a prerequisite for the successful operation of manufacturing, retail, labour, and housing markets (Smith 1880; Rostow, 1962; Rashidi and Samimi, 2012).

These transportation infrastructures were part of the economic growth planning that took place during the industrial revolution in the 19th and early 20th centuries, a model that still exists today, in which transportation planning and investments are linked to a region's expected economic growth goals (Rashidi and Samimi, 2012). Mobility studies reveal that the importance of transportation is crucial to economic productivity and the global economy's competitiveness. According to an international study, every 10 percent increased pace of travel boosts the labour market by 15 percent and productivity by 3 percent. (Banister and Berechmann, 2000).

Most developing countries have a colonial history, putting them at a disadvantage in terms of economic growth preparedness, particularly in the case of transportation infrastructure systems, partly because the existing transportation systems they must build on to get the best results for their investments are frequently out of step with today's economic growth patterns. The identification of the productivity effects of transportation has been among the most popular difficult econometric tasks. The transportation sector supports the more visible forms of capital by allowing the supply of raw materials to manufacturing facilities and completed commodities to retail outlets (Beyzatlar and Kustepeli, 2011; Kustepeli, 2012; Kim, 2014).

Rather than starting from a place of strength, such as having a transportation infrastructure comparable to that of colonial government nations, these former colonial countries, such as Nigeria, inherited poorly developed roads that only connect a few major cities and are primarily designed to facilitate the movement of commodities from colonial regions to ports of call shipment to colonial countries (Njoh, 2012). Rural inhabitants, which are usually seen as a significant portion or even the backbone of the economy in industrialized countries, are virtually cut off from any real economic developing nation's participation (Njoh, 2012; Thomas, 2013; Usman, 2014). Given the starting point of the country's transportation infrastructures, even the most capable, forward-thinking leader may find it fiscally tough and politically overwhelming to take the country ahead into a more robust economic position rapidly.

In theory, increasing transportation infrastructure investments should boost not only the economy's overall output and development, but also the price competitiveness of domestic and exported goods and services, promote new business creation, affect employment levels, lower costs, and improve quality of life (Kim, 2004). Nigeria's policymakers must fully comprehend the effects of transportation infrastructure investments on economic growth, where to direct the investment, how much to invest as a percentage of GDP, and what such investment can mean to the country's wealth and power in order to give back to their country well (Calderon and Serven, 2008). For example, although many poor countries spend just approximately 2 percent of their GDP on transportation infrastructure each year, China has reportedly committed to spending 7 percent of its GDP on transportation infrastructure (Commission on Growth and Development, 2007).

Many scholars agree that the link between transportation infrastructure and growth in the economy requires a new paradigm that takes GDP, population size, degree of urbanization, traffic density, economic growth rate, and road infrastructure into account. Regional economic theories have been examined in relation to transportation investment and its impact on population change and economic growth using growth theories (Nobrega and Stich, 2010). The transportation sector is key for the flow of commodities and services that are critical to a country's economic vitality, and it has recently been characterized as the most crucial engine for economic growth by several researchers.

A developing country such as Nigeria can learn an important lesson from the planned investment that the United States made in its road networks and interstate highways by linking its transportation infrastructure planning and implementation of economic growth activities that lead to sustainable economic growth. Transportation becomes the backbone in any economy, particularly Nigeria, as such the anatomy of inefficiencies and a lack of a solid transportation network in Nigeria, along with the country’s low rate of economic growth (GDP) is critical as it is the government’s bad transportation policy (Akinbobola, 2004).

Nigeria's road networks, according to the United Nations Development Programme (2009), are among the worst and deadliest in the world. According to data from the UN Development Programme and the World Bank, Nigeria possesses one of the worst transportation infrastructure systems in the world, as well as one of the most affordable rates of economic growth. Technological change and human capital availability, including positive economic externalities in terms of quality labor force, are key necessary preconditions identified to find in the literature to allow positive economic growth elasticity relative to road infrastructure investments in developing countries, Investments from private and public sources, environmental sustainability, literacy, and other activities are all dependent on governments and communities working together to foster economic transformation.

1.2 Statement of Research Problem

There are various challenges in the transportation sector of the Nigerian economy. These issues are a major source of concern for both the economy and the government as a whole. The transportation sector serves as a source of foreign earnings, additionally, as a way of transporting goods and services to the country's various nooks and crannies (Trotter, 2012). The federal, state, and municipal governments have all worked together to guarantee that transportation infrastructure develops across the country. Inadequate finance facilities, on the contrary, have been cited as a major impediment to upgrading transportation in Nigeria. Because of the local demand for transportation infrastructure, the country has the ability to become a key link in the regional transportation system for the transit of commodities manufactured in the countryside (where most manufacturing facilities should be located). Without well-connected inner perimeter highways, airports, seaports, and train stations, a country cannot become a manufacturing behemoth (Thomas, 2013).

The government cannot possible carry out all of these operations without the participation of the commercial sector in the construction of transportation facilities like as airports, trains, and seaports, as well as state toll collecting for road and highway maintenance (Singleton, 2010). The country's reliance on food importation has been worsened by decades of neglect of rail and rivers, thus agricultural produce from one section of the country cannot be delivered affordably to other parts (Silverman, 2013). Many farmers have been disheartened due to a lack of affordable transportation, and their harvest has perished because of their inability to access the market. The country has also continued to avoid potential socio-economic losses by expanding the railway network to all states so that agricultural produce may be transported cheaply to urban markets. It is sad that the existing north-south colonial rail truck for the movement of commodities cannot be maintained. This is the primary reason for the colonial masters' fusion of the north and south to facilitate the transfer of commodities and services.

1.3 Research Questions

The following questions will direct the course of this study:

1) what is the growth implication of road transportation in Nigeria?
2) how does railway transportation affect economic growth in Nigeria?
3) what is the effect of airway transportation on the Nigerian economy?
4) what is the impact of waterway transportation on economic growth in Nigeria?

1.4 Research Objectives

The main objectives of this study is to investigate the effects of transportation sector on economic growth in Nigeria between 1970 and 2020. The specific objectives are to;

1) examine the growth implication of road transportation in Nigeria.
2) determine the impact of railway transportation on economic growth in Nigeria.
3) examine the effect of airway transportation on the Nigerian economy.
4) determine the impact of waterway transportation on economic growth in Nigeria.

1.5 Research Hypothesis

The hypothesis to be tested in this course of study includes:

Hypothesis 1

H_0: Road transportation has no impact on economic growth.

H_1: Road transportation has impact on economic growth.

Hypothesis 2

H_0: Railway transportation has no impact on economic growth.

H_1: Railway transportation has impact on economic growth.

Hypothesis 3

H_0: Airway transportation has no impact on economic growth.

H_1: Airway transportation has impact on economic growth.

Hypothesis 4

H_0: Waterway transportation has no impact on economic growth.

H_1: Waterway transportation has impact on economic growth.

1.6 Significance of the Study

The study of the Nigerian economy's transportation system is crucial because it will provide insight into the causes of transportation problems as well as solutions in the form of policies that will help to alleviate those problems. By decreasing and removing various essential challenges, the efficiency of the Nigerian economy's transportation sectors will have a positive impact on the national economy. Construction of new transportation revitalizes the transportation business, which boosts economic activity because transportation is the undisputed backbone of all other sectors in every country. (Banister and Berechman, 2001; Khasnabis et al, 2010; Lakshmanan, 2011).

The research reveals how good transportation networks affect transportation costs, travel time, and other elements that influence a country's economic development. Nigeria's link between transportation investment and economic growth was investigated using a qualitative case study, which will be useful to policymakers evaluating sensible resource allocation in Nigeria and other developing countries (Foster and Pushak, 2011). Furthermore, a large body of knowledge demonstrates that in a developing country like Nigeria, a solid transportation network is a vital component in the fight against poverty (Kustepeli et al., 2012; Njoh, 2012).

Access to a robust transportation network will assist trade by allowing rural farmers to move their agricultural products and their crops to reach markets. It will also cut travel time, leading in lower transportation expenses, a higher level of living, a lower number of accidents, and lower agricultural product transportation costs. (Akhmetzhanoy and Lustoy 2013; Dietzenbacher and Tukker, 2013; Osayomi, 2013).

1.7 Scope of the Study

The study covers the period between 1970 and 2020. Our choice of this period arose from the availability of data. This period is long enough to capture the link between the transportation industry and economic growth.

1.8 Organization of the Study

This study is divided into five chapters. Chapter one contains the introductory insight into the study. This is sub-divided into the background to the study, statement of research problem, research question, research objectives, research hypothesis, significance of the study, scope of the study and organization of the study respectively. Chapter two is based on literature review. Chapter three focuses on the methodology of the study specifying the models to be used for the analysis. Chapter four comprises of the estimated growth implication on road transportation, the impact of railway transportation on economic growth, effect of airway transportation on the Nigerian economy and the impact of waterway transportation on economic growth in Nigeria. Summary, conclusion and recommendations are presented in chapter five.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter is divided into four parts. Section 2.2 presents the conceptual review. Section 2.3 depicts the theoretical review of the research. Section 2.4 focuses on the empirical review on the impact of transportation on economic growth in Nigeria. Finally, section 2.5 shows the gap in the literature.

2.2 Conceptual Review

2.2.1 Transportation

Transportation is seen as a method of conveyance. It is the movement of goods and services from the point of production to the final consumers. Without this process, production is a waste. There are different means of production which are; road, rail, water, air and pipeline transportation. Goods and services can be dispersed by any of these forms of transportation depending on the fragility of such goods. Transport enables trade between people which is essential for the growth of civilization. Transportation networks are inextricably linked to socioeconomic shifts. The core of this relationship is people mobility, freight mobility and territory accessibility. Where transportation infrastructures can meet mobility needs and ensure access to markets and resources, economic possibilities are likely to emerge (Jean, Claude and Brian, 2006).

2.2.2 Economic Growth

When comparing one period to the next, economic growth is defined as an increase in the production of economic commodities and services. It can be expressed as a nominal or a real term. Gross National Product (GNP) or Gross Domestic Product (GDP) are two expressions used to describe aggregate economic growth (GDP). Alternative measures are frequently employed. Aggregate production gains are frequently associated with higher average marginal productivity, which leads to increasing transportation costs. It also leads to a rise in earnings. Physical capital, human capital, labor force and technology are all often used to model growth in economics. Economic growth has historically relied on expanding the capacity and efficiency of transportation, yet transportation infrastructure and operations have a significant influence on the environment, making transportation the main energy drainer, making transportation sustainability a serious concern.

2.3 Theoretical Review

2.3.1 Theories of Transportation

2.3.1.1 Frischmann theory of Transportation

The economic theory of transportation was popularized by economist Frischmann (2005). Frischmann's transportation theory provides a theoretical foundation for examining a country's transportation network's contribution to economic growth and the social consequences in developing countries. Frischmann argued that allowing the public open access to transport networks would create an economic return for the society and lead to social change. Frischmann's economic theory of transportation has focused on the demand side of an economy and searches for how transportation infrastructure such as network of roads can create value for a wider public. The central premise behind this theory is value creation. Since analysis of transportation infrastructure and its relationship to economic growth is multidimensional, many researchers have posited that such an analysis must consist of many components including GDP, population size, degree of utilization, traffic density and level of economic growth. Applying Frischmann's economic theory of transportation to this study, it is expected that allowing that allowing the public access to network would significantly impact economic growth by improving the standard of living of the masses and would result in social change.

2.3.1.2 Charles Horton Cooley's theory of Transportation

Transportation, according to Cooley, is a spatial and physical mode of communication. He also offers an interactionist theory of valuation, articulating how communication and interaction shape and transform value as a goal of action. These findings show that transportation as mode of communication will alter and grow economic society by altering personal needs and values resulting in behavioral changes. According to Cooley's theory, for studying the subjective side of transportation phenomena, an interactionist approach is useful. Cooley's transportation theory has been viewed from a variety of perspectives.

Mechanical and Geometrical Notions

According to Cooley, the best mode of transportation is one that moves things with the least amount of force and in the shortest amount of time. Then there's speed, and then there's economy of force, which translates to "cheapness" in real-world terms. In the most complicated evolution of transportation, speed and cost are always the most basic tests of its efficiency. He arrived at some notions not without importance while considering their simplest form, the geometrical conditions of transportation. Motive and vehicle, the means by which force extracted from one or more fundamental sources to which man has access is arranged and used to serve the purposes of transportation can be thought of as force. The force used in the early stages of conveyance was that supplied by nature in some direct and evident form.

The immediate object of transportation with reference to the physical features of the earth's surface is to overcome natural obstacles by making use of natural forces. These obstacles and forces form a basis for the various kinds of conveyance actually met with in history. The investigation of the subject requires the division of movement into land and water, as well as the classification of obstacles by land and water, while the investigation of the various forces that have been used and the manner in which they have been used in overcoming obstacles is equivalent to studying the mechanical development of transportation.

The Relation of Land Transportation to Physical Conditions

Mountains, mountain ranges, hills and all inequalities of the surface are the chief obstacles to movement by land. Generally speaking, the higher the steeper, the sharper their summits and the more extensive and continuous these mountains, hills and inequalities are, the more formidable obstacles they make. Forests, thickets and other vegetable growth are large enough to hinder movement. A dry climate is favorable to transportation in its early development not only because of freedom from mud and marshes but also to diminish the number and size of stream, hinder the emergence of gullies and other lesser and sharper inequalities of the surface because of the action of the water and also renders impossible the growth of large vegetation.

Water Carriage as related to Physical Conditions

The water presents none of those permanent inequalities of surface that are such important elements in all movement by land, yet, it offers a natural diversity, which results in obstacles and facilities of another sort. Among conditions, which may seriously impede movement by water, are currents (which are either caused by the regular flow of rivers, by tides or by the movement of deep sea), winds, waves, rocks, shallows, island and many more. In marking off steps in the growth of water transportation, the following is a convenient division; the period of river transportation, the navigation of coasts, the open sea by sailing vessels and the modern period of stean propulsion.

2.3.1.3 Wilson's Theory of Transportation

The work by Wilson (1970, 1974) is center-pieces in the literature. Later Wilson, Jebbin, Maclean Felix (1977) established a 1977-state-of-the-art in their rather comprehensive work on "Models of Cities and Regions" applied to the City of Leeds. The model system constituted a system, which was comprehensive in terms of scope but slightly less refined in terms of its linkage to human behavior and economic mechanisms. Among its sub model was a relative term advanced population forecasting model which applied "accounts based models" and "transition rate models". Another component of the system was a model to locate people and services. This was a slightly altered version of an original model suggested by Lowry (1964) and consisted of two gravity models with constraints related to land use accounts and minimum size of service establishments. From a financial standpoint, the Lowry tradition is artificial, meaning, demand is modelled without any price-equilibrium mechanism. This is one of the system's major flaws of Wilson's model for Leeds. However, other limitations exist, which primarily is concerned with the ability to capture heterogeneity or disaggregated behavior. The fact that gravity models assume identical independent distributed entries puts a serious limitation on the model flexibility. For instance, the substitution pattern between alternatives will be relative simple and will usually correspond to that of a simple logic model.

The model works fine for aggregated smooth quantities but have serious limitations when considering disaggregate data. As noted by McFadden in his 30year retrospect of RUM (McFadden, 2000), the fact that gravity models couldn’t easily handle issues like mode choice, trip generation and trip timing after the idea seems to be catalyzed by the introduction of new modes or other big system changes, which couldn't represent the behavior of fine-grained changes in the transportation system. (the RUM). The greatest achievement of Wilson and his team was the establishment of a systematic framework for dealing with transport in which the various components of transport were described and linked. This has lead the way we think about transport ever since.

2.3.2 Economic Growth Theories

2.3.2.1 Solow-Swan Growth Theory

Trevor Swan and Robert Solow first proposed the neoclassical growth hypothesis in 1956. Solow’s (1956) growth model is an exogenous economic growth model that examines variations in the amount of output in an economy over time as a result of changes in population growth, savings rate, and technical development rates. The core premise of Solow’s paradigm is that it relates aggregate production function or input to productivity or output. Solow describes the marginal utility to be gained from productivity, capital investment and labor, and argues that technological progress in developed nations will rise at a certain time and finally fall. Solow argued that the common price of production will rise in a developed nation. He viewed transportation infrastructure planning, investment and implementation as different from the planning economic growth process, while the opposite occurred in the developing nation due to continued increase in marginal utility of labor and capital investment. Solow’s theory supports the notion that investment is to be made in transportation network.

A typical Solow’s model predicts that economies will converge to their steady state equilibrium in the long run, and that the only way to achieve permanent growth is through technical advancement. Solow’s concept has an important implication which is that poor countries should expand quicker and eventually catch up to affluent countries. Baumol tested this theory empirically and discovered a close link between a country’s initial wealth and its output growth over a lengthy period of time (1870-1979). Delong later disputed Baumol’s conclusions, claiming that both the non-randomness of errors for estimates of real income per capita in 1870 and Baumol’s findings were skewed. According to Delong, there is little evidence to back up the theory.

2.3.2.2 Harrod Domar Growth Theory

The Harrod Domar growth hypothesis is used to describe the pace of economic growth in terms of savings and capital. It claimed that there is no natural cause for a country’s economy to grow in a balanced manner. Roy F. Harrod and Evsey Domar each formulated this hypothesis in 1939 and 1946, respectively. Neoclassical economists contended that the Harrod-Domar theory had flaws, specifically the instability of its solution, which sparked an academic debate in the late 1950s that led to the development of Solow-Swan theory. Solow expanded on the Harrod-Domar model by including labor as a factor of production and non-fixed capital-output ratios. Increasing capital intensity may now be recognized from technological advancement thanks to these advances. The constant proportions production function, according to Solow, is a fundamental assumption in the Harrod-Domar model’s instability conclusions. His own work extends on this by delving into the implacability of the human condition. One major critique is that Harrod’s original paper did not focus on economic growth and did not employ a fixed proportions production function explicitly.

2.3.2.3 Growth Pole Theory

Growth pole theory is driven by the concept that growth is usually not uniformed across a region but is often concentrated at a specific pole. The pole represents a concentration of economic activity in one area from which growth is enforced to other regions. Growth pole theories were known within the 1960s to the early 1970s and many countries including developing countries thereby accepting them as guides for their national growth strategies to decrease regional difference in incomes, employment and educational accessibility. Growth pole theories were used to facilitate decentralization and encourage rapid economic growth. Growth pole theories are useful for assessing population change as they can suggest best use of limited regional resources to be invested, allocated or distributed for maximum effect on economic growth.

The core notion of the growth poles theory is that economic growth does not occur evenly across a region, but rather around a single pole. Regional development is imbalanced due to size and agglomeration economics at the growth pole. Transportation, particularly transportation terminals, can play a key role in this process. The more transportation-dependent or linked an activity is, the more likely and strong this link is. Secondary growth poles can occur later, primarily if a secondary industrial sector emerges with its own associated industries that contribute to regional economic variety. Global supply chains have called into question numerous aspects of the growth poles theory, as growth and links established by a core industry can affect activity in other parts of the world.

2.3.2.4 Location Growth Theory

Location growth theories explains the distribution of economic activity as it relates to the functional allocation of activities to locations, the location of individual activities, the division of spatial markets among producers and the distribution of different types of production across portions of territory. The aim is to exclude from the analysis any geographical features that may be influencing the concentration of territorial activities leaving the location choices to be explained by the economic factors that define location processes such as the agglomeration of economies that cause economic activities to concentrate and the transportation cost that distribute activities in space.

2.3.2.5 Modernization Theory

The term "modernization theory" is used to describe the process of society's modernization. Modernization is a model for making a gradual shift from a pre-modern or traditional civilization to a modern one. Talcott Parsons, a German sociologist, coined the term "modernization theory" (1902-1979). The theory considers a country's internal factors, assuming that traditional countries may be brought to development in the same way that more industrialized ones have. In the 1950s and 1960s, modernization theory was a dominating paradigm in the social sciences, but it then faded away. It made a resurgence after 1991, although it is still a divisive model. It strives to explain the process of social evolution by identifying the social elements that contribute to social progress and growth.

The functional necessity of component bureaucracy for welfare state development is stressed by modernization theory, because effective taxation and administration of complicated distributional programs are impossible without it. Internal influences were stressed in modernization theory, with science being an exception. Relationships with industrialized countries, particularly with international transportation businesses, were considered as obstacles. Forces outside the national economy hampered economic expansion. The weak economic growth was attributed to the unequal exchange relationship between developed and developing countries.

2.4 Empirical Review

2.4.1 Studies in Developed Countries

The development of transportation infrastructure and its connection with economic development has long been established in both the public and private sectors, especially in developed countries. Transportation infrastructure was the focus in Smith's vision of economic development." No transportation means no trade, no specialization, no economies of scale, no productivity progress and no development" (Smith, as cited in Prud'homme, 2005). For much of the developed world, there have been studies carried out and public input has been sought before transportation infrastructures were budgeted and built. Traditionally, companies (local, national, and international) established their presence and facilities around transportation sources to benefit from access to raw materials, distribution channels, and customer base (Njoh, 2012). This led to investment in transportation infrastructures such as railroads, airports, and seaports with economic connections crowding and enhancing economic growth (Porter, 2000).

In industrialized countries like the United States and the United Kingdom, there is a growing body of research on the link between transportation network investment and economic growth (i.e. Aschauer, 1990; Eisner, 1991; Iyanova and Masarova (2013); Munnell, 1992; Nobrega and Stich, 2012; Usman, 2014.

2.4.2 Studies in Developing Countries

For many developing countries, transportation infrastructure planning, investment and implementation are seen as different from economic growth planning. This is due in part to the existing colonial-era transportation infrastructure system, which was designed without regard for long-term economic growth (Njoh, 2012). Road infrastructure serves as the backbones for most transportation infrastructures in these developing countries, without the benefits of feasibility studies, economic studies, and environmental impact reports that typically accompany transportation infrastructure planning, investment, and implementation in the Western world. The goal of this research was to better understand the relationship between Nigerian economic progress and transportation infrastructure, notably road network expansion. This research provides guidance to developing countries including Nigeria to focus on transportation infrastructure investment more efficiently and in a way that may better support economic growth. This study presented a differentiated view of road transportation infrastructure investment as an important subset of the economic capital, and more particularly as an important means for advancing the economy of a developing country.

Bagchi and Pradhan discovered a bidirectional causality between road transportation infrastructure investment and economic growth, as well as between road transportation and capital formation. Bagchi and Pradhan also found that rail infrastructure had a unidirectional causality between economic growth and rail transportation, and gross capital formation and rail transportation. Gross capital formation and the construction of transportation infrastructure (roads and rail), according to Bagchi and Pradhan, must proceed hand in hand for the economy to enjoy significant growth.

Lakshmanan (2011) argued that a transportation investment lowers costs and increases accessibility because transportation improvements modify the marginal costs of transport producers, the household's mobility and demand for goods and services. Such changes propagate through the market mechanisms employment growth from within, output and income in the short run (Lakshmanan, 2011).

Scholars examining the relationship between transportation infrastructure investment and economic growth have concentrated on how much money is needed to build projects and the projected return on investment rather than the specific relationships. (Lakshmanan, 2011; Pradhan and Bagchi, 2013; Prud'homme, 2005; Shafik, 2005). In contrast, only a few studies have looked into the probable link between transportation infrastructure investments and economic growth in developing countries like the Federal Republic of Nigeria. Many of the scholars who have looked into the links between transportation infrastructure investment and economic development have looked through broad lenses rather than focused on the specifics of capital (Bagchi and Pradhan, 2013; Lakshmanan, 2011; Prud'homme, 2005; Shafik, 2005).

Thomopoulos (2009) created a more complex conceptual model that explored GDP, accessibility, population, employment, socioeconomic indicators and the labor force and examined how Greece tied its own practice to the EU's national regional policy and recommendations. In this model, Greece created its own national regional Strategic Guidelines built around the European Union model for identifying its transportation investment priorities. The Spatial and Socio-Economic Impacts (SASI) model is used to assess spatial impacts of transportation infrastructure of European significance with social-economic factors.

2.4.3 Studies in Nigeria

Transportation infrastructure in Nigeria has traditionally been built to facilitate movement of people, goods and services. The creation of economic growth activities beyond the movement of goods has been a secondary consideration (Njoh, 2008). These studies rely on data from economic clusters such as train stations, motor parks, airports, and seaports to show the connection between transportation infrastructure economic growth and investment

Road Transportation in Nigeria

With respect to road travel, it is important to evaluate the extent and quality of the road network. The federal government has made significant progress in improving the coverage of Nigeria's road network over the last fifteen years. The Directorate of Food, Roads, and Rural Infrastructure (DIFFRI), for example, launched on a campaign in the late 1980s to develop nearly 60,000 kilometers of new rural roads. Many of the roads that have been built are in a poor condition of disrepair, as can be witnessed on a tour of rural areas (Walker, Gilbert James, 1939). Many rural and urban roads have not gotten appropriate repair, as has been the case with so many things in post-oil-boom Nigeria. In the wet season, poorly maintained roads are especially challenging (approximately March to October). In fact, during the dry season, some remote regions are only accessible by car (Gumel, 2013). Field trips to Nigeria's Jos Plateau in July amply demonstrated these points. Many rural roads in the Plateau region cannot be safely travelled at speeds exceeding 25 to 30 miles per hour (Drummond-Thompson, Phillip, 1993).

Given the big and numerous potholes that litter the many country roads, a leisurely pace is required. Motorized vehicles have bypassed the old roadway to build new dirt tracks on certain portions of rural roads that are so terrible. Some rural roads have been reduced to only one lane. The Jos Plateau's road network exemplifies the poor status of many rural roads' maintenance. Despite the fact that a good network of colonial-era roads existed, many of these roads were not maintained in the post-independence period, mainly due to the intensity of mining activities on the plateau. Because rainstorms can be extremely intense, proper maintenance is essential. As a result, during the wet season, minor patches of road degradation can quickly spread due to erosion and weathering. The lack of proper drainage infrastructure, which makes driving dangerous during heavy rains, exacerbates many of the issues related with roadway erosion.

Although urban roads are in better condition than most rural roads, maintenance of roads is also a problem in the cities. State budgets have been exceedingly tight since the early 1980s, when oil prices collapsed, and the implementation of a Structural Adjustment Program in 1986. Corrupt military regimes have exacerbated fiscal austerity by diverting state funds to non-productive projects (typically contracted to enterprises owned by military commanders) or offshore bank accounts. State budgets have been severely tight since the early 1980s, when oil prices collapsed, and the 1986 deployment of a Structural Adjustment Program. Military regimes that have channeled state money into non-productive enterprises (typically contracted to firms owned by military commanders) or overseas bank accounts have further aggravated fiscal austerity. His crucial factor to remember is that, in addition to making travel unpleasant, inadequate urban roads can produce traffic jams and contribute to traffic congestion (Walker, Gilbert James, 1939).

According to Ukwu (1985), there were about 1,300 kilometers of motorable roads in 1925, 40,000 kilometers in 1950, and 100,000 kilometers in 1975. In 1980, Nigeria had a total of 114,768 kilometers of roads, with the additional length of Federal Government roads being 34,340.95 kilometers in 2003 and 34,341.25 kilometers in 2006. There are international highways that connect Nigeria to Niger Republic via Zinder; Cameroon via Marocia or Mamfe; Republic of Ghana, Togo, and Benin via Idiroko; and Republic of Chad via Ndjamena (Anyanwu, Oaikhena, Oyefusi and Dimowo, 1997). Nigeria has a total of 193,200 kilometers (120,049 miles) of road. Between and within cities, the majority of Nigerians travel by bus or cab. Several expressways and trans-regional trunk highways were built and rebuilt by the federal and state governments during the 1970s and 1980s. Smaller roads were also renovated by state governments, allowing rural areas to thrive. However, by the mid-1990s, most of the roads had deteriorated due to a lack of funding.

Rail Transportation in Nigeria

Because of its relative safety, reliability, lower user costs, and unique ability to reshape the national economy through mass movement of people, products, and services, rail transportation has a lot of potential. In this setting, the need for a functional railway system, as well as the great potential for successful rail infrastructure investment in Nigeria, are undeniable. The country's rail network now spans 3,557 kilometers, with 3,505 kilometers remaining on the narrow gauge. According to statistics on the corporation's passenger and freight traffic, there were an average of 4,342,000 passengers and 1,098,000 tonnes of freight in 1974. Passenger traffic increased from 7 million in 1978 to 15.5 million in 1984, before dropping to 3.0 million in 2003. (Oshin Siji and Stock Watch, 2013).

The roadways have been lengthened but the rails have remained static. In 2005, the country has around 193,200 kilometers of road. Federal roads account for 34,123 kilometers, states for 30,500 kilometers, and local council highways for 129,577 kilometers. More than 90% of domestic freight and passengers transit over these roadways. As a result, too much stress was placed on the inadequate road infrastructure, resulting in constant collapse and massive financial outlays for maintenance and repair (Oshin Siji, 2013).

Nigeria has 3,528 kilometres (2,192 mi) of railway track that is in use. The main line, which was finished in 1911, connects Lagos and Kano, with extensions to Nguru, Zaria, and Kaura Namoda, and Minna to Baro. Due to competition from the road network, the utilization of trains for both passenger and freight transportation has decreased. Anyanwu et al (1997) presented passenger traffic of 9.6 million in 1960-1971, 6.1 million in 1972-1978, 8.2 million in 1979-1982, 11.5 million in 1983-1987 and 4.4 million in 1988-1992, thus giving a peak in 1983-1987. The figures in the first decade of the 21st century are 987,088 in 2002; 1,622,271 in 2003; 1,751,159 in 2004 and 752,482 in 2005 (NBS, 2008)

Airways Transportation in Nigeria

Government agencies have been attempting to establish a concession model for airports, but the results have been equivocal. In an effort to improve infrastructure quality, recent governments have offered direct money for terminal enhancements and runway expansions. The concessioning of Terminal II of Muritala Mohammed Airport to Bicourtney Ltd is the only successful case of concessioning (Bankers Committee Report).

The majority of state capitals are served by internal flights, with Kaduna, Port Harcourt, and Enugu being the busiest. Nigeria Airways, the national carrier, offers both domestic and international flights. Several small regional carriers also compete for domestic traffic. . Since the 1970s, air transportation has grown rapidly, however not all cities are connected, and the connection structure enhances the road and rail networks. Nigeria now has 20 international airports, including Muritala Mohammed in Lagos, Aminu

Kano in Kano, Port Harcourt, Margeret Ekpo in Calabar, and Nnamdi Azikiwe in Abuja. Akure, Benin, Enugu, Ibadan, Ilorin, Jos, Kaduna, Maiduguri, Makurdi, Sokoto, Yola, Minna, Owerri, Katsina, and the newly finished Akwa-Ibom airport at Mbo are among the others. Because the names of most current airports correspond to the names of states or state capitals, this means that 19 of the 36 states have airports (Wilson, 2005). The number of passengers transported increased from 597,270 in 1975 to 2,575,038 in 1985 before beginning to decline to 354,000 passengers in 1993. (Anyanwu at el, 1997). Passenger arrivals at international and domestic airports in recent years have been 3,920,031; 4,938,077; 4,501,785; 4,532,334; and 5,700,311 accordingly for 2003, 2004, 2005, 2006, and 2007 while the corresponding figures for passenger departures are 3,930,644; 4,443,537; 4,785,263; 4,573,457 and 4,725,785 (NBS, 2008).

Waterway Transportation in Nigeria

One important feature of the policy issues in the water transport is National Inland Waterways Act. In addition, most road transportation policies apply to water transportation infrastructure. The majority of seaports have been leased to the private sector, and they operate under two different models (the landlord model and the service port model). The landlord model appears to be the most popular. When compared to other types of transportation, seaport concessions are the most successful (Bankers Committee Report).

Nigeria's largest ocean ports are at Lagos (Apapa and Tin Can Island), Port Harcourt, Calabar, Sapele, and Warri. The main petroleum-exporting facilities are at Bonny and Burutu. During the colonial period, inland waterways, particularly the Niger and Benue rivers, were vital for transportation. The government upgraded river ports in Onitsha, Abeokuta, Lokoja, Baro, Jebba, and Yelwa in the late 1980s. To make passage easier, locks have been built at Kainji Dam. River transportation is mostly used to convey products. Apapa, Tin-Can Island, Port Harcourt, Okrika, Federal lighter Terminal, Bonny, Warri, Koko, Sapele, Container Terminal, Roro, Federal Ocean Terminal, Calabar, and Tuma are among Nigeria's 14 seaports. For example, in terms of foreign trade cargo loaded and discharged at Nigerian ports between 1999 and 2005, the figures are 96,817; 111,279; 10,679,109; 13,288,917; and 13,551,854 for the loaded, and 13,975; 15,991; 23,099,847; 23,359,879 and 26,051,234 for the discharged, respectively for the 1999, 2000, 2003, 2004 and 2005 periods (NBS,2008).

2.5 Gap in Literature

Only a few researchers have looked into the impact of the transportation industry on Nigeria's economic growth. The majority of studies focus entirely on the impact of road transportation on economic growth, with alternate forms of transportation receiving minimal attention. As a result, this study fills a knowledge gap by examining the impact of road, rail, air, and water transportation on Nigeria's economic growth.

CHAPTER THREE

Methodology

3.1 Introduction

This chapter presents the methodology used in this study. Section 3.2 covers the theoretical framework employed in the study. Section 3.3 focuses on the model specification. Section 3.4 entails definitions and measurement of variables and section 3.5 covers the estimation technique applied in the study.

3.2 Theoretical Framework

Economist Frischmann popularized the transportation economic theory (2005). Frischmann's transportation theory provides a theoretical foundation for examining a country's transportation network's contribution to economic growth and the social consequences in developing economies. Frischmann believed that allowing the general people free access to transportation networks will result in a greener environment. Frischmann's transportation economic theory focuses on the demand side of the economy, looking for ways that transportation infrastructure, such as a road network, might add value to the general public. The generation of value is the primary concept of this approach. Numerous academics have proposed that a multidimensional examination of transportation infrastructure and its relationship to economic growth must include many components, including GDP, population size, degree of utilization, traffic density, and level of economic growth. Allowing public access to the network, based on Frischmann's economic theory of transportation, is projected to have a substantial impact on economic growth by enhancing the standard of life of the people and resulting in social change.

The challenges that plague Nigeria's modern transportation infrastructure are a relic of the past. Mismanagement of road, rail, water, and air infrastructure during colonial and post-colonial periods has contributed to Nigeria's economic and social difficulties. At the same time, as evidenced in the Nigerian taxi drive, Nigerians were able to take advantage of opportunities in transportation networks for economic growth. In comparison to the early 1980s, when automobiles were very inexpensive, many Nigerians had difficulty acquiring automobiles. As a result, Nigeria now has a robust market for secondhand automobiles, many of which are imported from other countries (like Europe).

3.3 Model Specification

The model shows the connection between transportation sector and capital stock (i.e. investment on transport infrastructure). This project adapted Dr. Akanbi Bosede, Bamidele Abalaba and Dunni Afolabi (2013) alongside Peter Siyan (2015) with few modifications.

To achieve the first objective, the model is estimated as follows;

Mathematically RGDP = f (ROT, GET, CUN) (1)

The above equation can be defined econometrically as;

$$lnRGDP = \theta_0 + \theta_1 lnROT + \theta_2 lnGET + \theta_3 lnCUN + \mu \quad (2)$$

To achieve objective two, to examine the economic impact of railway transportation, the model is estimated as follows;

Mathematically; RGDP = f (RAT, EXCHR, INF) (3)

The above equation can be defined econometrically as;

$$lnRGDP = \beta_0 + \beta_1 lnRAT + \beta_2 EXCHR + \beta_3 INF + \mu \quad (4)$$

To achieve objective three, to determine the impact of airway transportation on economic growth, the model estimated is as follows;

Mathematically, RGDP = f (AIT, POP, FDI) (5)

The above equation can be defined econometrically as;

$$lnRGDP = \delta_0 + \delta_1 lnAIT + \delta_2 lnPOP + \delta_3 lnFDI + \mu \quad (6)$$

To achieve objective four, to determine the impact of waterway transportation on economic growth, the model estimated is as follows;

Mathematically, RGDP = f (WAT, INT, INR) (7)

The above equation can be defined econometrically as;

$$lnRGDP = \alpha_0 + \alpha_1 WAT + \alpha_2 lnINT + \alpha_3 lnINR + \mu \quad (8)$$

Where;

RGDP = Real Gross Domestic Product implies that the GDP is measured using a constant price, i.e. the value of the GDP for different year is measured using the price of a base year. ROT is the amount of road transportation in the gross domestic product, RAT represents the rail transportation, AIT is the air transportation and WAT represents waterway transportation. GET is the government expenditure on transportation, CUN is the capital utilization on transportation infrastructures, EXCHR is Exchange Rate, INF represents Inflation, POP is Population Growth, FDI represents Foreign Direct Investment, INT means Interest Rates and INR represents Investment Rate. The model has formulated RGDP as the dependent variable, ROT, RAT, AIT and WAT as the independent variables and GET, CUN, EXCHR, INF, POP, FDI, INT and INR as control variables. RGDP, ROT, RAT, AIT, WAT, GET, CUN, POP, FDI, INT and INR were logged due to the large nature of their values. EXCHR and INF were not logged since they are in rates.

3.4 Definitions and Measurement of Variables

The data was sourced through secondary sources. It was obtained from the World Development Indicators (WDI) 2020, Central bank of Nigeria (CBN) Statistical Bulletin 2019, National Bureau of Statistics (NBS) 2019 and Transportation Index Database (TRID Database) 2020.

Table 3.1: Definitions, Measurement and Sources of Variables.

Variable	Definition/ Measurement	Source
RGDP	Real Gross Domestic Product is the total market value of all final goods and services produced in an economy in a year adjusted for the effects of inflation. It is measured in annual percent.	CBN statistical bulletin/WDI 2020.
ROT	Road transportation is the transportation of goods and personnel from one place to another on road.	TRID Database.
RAT	Rail transportation is also known as train transportation. It is a means of transportation on vehicles which run on tracks (rails or railroads). Measured in total route-km.	WDI 2020.
AIT	Air transportation is the movement of passengers and cargo by aircraft such as	WDI 2020.

	airplanes and helicopters. Measured in million ton-km.	
WAT	Waterway transportation is also known as marine transportation. Its moves people and goods via coastal and inland waterways.	National Bureau of Statistics.
GET	Government expenditure on transportation. It is measured in current US$.	WDI 2020.
CUN	Capital utilization on transportation infrastructure in Nigeria. It is measured in us dollars.	WDI 2020.
POP	Population growth in Nigeria. It is measured in annual percentage.	WDI 2020.
FDI	Foreign direct investment is measured in percentage of GDP.	WDI 2020

INT	Interest rate is measured in percentage. It is measured in percentage.	WDI 2020.
INR	Investment rate is measured in percent of GDP.	CBN statistical bulletin.
EXCHR	Exchange rate is measured in LCU per us dollars.	WDI 2020.
INF	Inflation rate is measured in annual percentage.	WDI 2020.

3.5 Estimation Technique

Auto-Regressive Distributed Lag (ARDL) Bounds Testing Approach is the estimation technique that is employed in this study in order to analyze if transportation sector has any impact on economic growth. The approach requires estimating the conditional error correction version of the ARDL model for variables under estimation. In order to evaluate the model specified below, the following techniques would be followed;

Test for Stationarity

In order to do any expressive policy analysis with the results of this study, it is important to differentiate between correlations that is developed from sheer trend (spurious) and one related to a primary causal relationship. To realize this, all the data used in the study are initially tested for unit root to establish that they are stationary. By stationary, what is intended is that (Gujarati, 2007) the mean and variance of the time series data are the same no matter how they are measured, that is, they do not vary with time. The test would help to detect spurious regression on the time series and it will also help in good forecasting. To know whether or not the time series data is stationary at any level, a unit root test using the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests are adopted.

Lag Length

A vital element in the specification of ARDL model is the determination of the lag length of ARDL. To choose the appropriate lag length, therefore, following the literature the information criteria such as the Akaike information criteria (AIC), Hannan-Quinn information criteria (HQ), the Log Likelihood (LL), the Schwarz information criteria (SIC) and the Final Prediction Error (FPE) were considered.

Co-integration Analysis

The use of ARDL Bounds Testing Approach becomes unacceptable when the time series data of the regressor and the regressed variable are not integrated of order zero (0). Given such a scenario, a co-integration analysis can be used to examine the long run relationship between the two variables that are not integrated of order zero (0). Co-integration analysis refers to a group of variables that move together, although individually they are non-stationary, meaning that they are likely to go upwards and downwards over time. After ascertaining that variables are stationary, it is required to determine whether or not there is a long term relationship between transportation sector and economic growth.

Short-run and Long-run Estimates

This technique generally provides unbiased estimates of the long-run model and valid t-statistic even when some of the regressors are endogenous (Harris and Sollis, 2013). Inder (1993) and Pesaran (1997) have shown that the inclusion of the dynamics may correct the endogenity bias.

In view of the above advantages, for objective one, the ARDL form of equation (2) is specified as follows:

$$\Delta InRDGP = a_0 + \sum_{i=1}^{a} \lambda_1 \Delta InRGDP_{t-i}$$

$$+ \sum_{i=0}^{b} \lambda_2 \Delta lnROT_{t-i} + \sum_{i=0}^{c} \lambda_3 \Delta lnGET_{t-i} + \sum_{i=0}^{d} \lambda_4 \Delta lnCUN_{t-i}$$

$$+ \theta_1 lnRGDP_{t-i} + \theta_2 lnROT_{t-i} + \theta_3 lnGET_{t-i} + \theta_4 lnCUN_{t-i} + \mu_t \quad (9)$$

Where Δ represents the first difference operator, $\mathbf{a_0}$ is the drift component and $\boldsymbol{\mu_t}$ is the white noise residual. The $\boldsymbol{\theta_s}$ represents the long run coefficient to be estimated when the $\boldsymbol{\lambda_s}$ represents short-run coefficients of the respective variables in the model. This study test the null hypothesis of cointegration H_0: $\theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$ against the alternative hypothesis H_1:$\theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq 0$.

For objective two, the ARDL model of equation (4) is specified as;

$$\Delta lnRGDP = a_0 + \sum_{i=1}^{a} a_1 \Delta lnRGDP_{t-i} + \sum_{i=0}^{b} a_2 \Delta lnRAT_{t-i} + \sum_{i=0}^{c} a_3 \Delta lnEXCHR_{t-i} + \sum_{i=0}^{d} a_4 \Delta lnINF_{t-i} + \beta_1 lnRGDP_{t-i} + \beta_2 lnRAT_{t-i} + \beta_3 EXCHR_{t-i} + \beta_4 INF_{t-i} + \mu_t \quad (10)$$

Where Δ represents the first difference operator, $\mathbf{a_0}$ is the drift component and $\boldsymbol{\mu_t}$ is the white noise residual. The $\boldsymbol{\beta_s}$ represents the long run coefficient to be estimated when the $\mathbf{a_s}$ represents short-run coefficients of the respective variables in the model. This study test the null hypothesis of cointegration H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ against the alternative hypothesis $H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$.

For objective three, the ARDL model of equation (6) is specified as;

$$\Delta lnRGDP = a_0 + \sum_{i=1}^{a} \eta_1 \Delta lnRGDP_{t-i} + \sum_{i=0}^{b} \eta_2 \Delta lnAIT_{t-i} + \sum_{i=0}^{c} \eta_3 \Delta lnPOP_{t-i} + \sum_{i=0}^{d} \eta_4 \Delta lnFDI_{t-i} + \delta_1 lnRGDP_{t-i} + \delta_2 lnAIT_{t-i} + \delta_3 lnPOP_{t-i} + \delta_4 lnFDI_{t-i} + \mu_t \quad (11)$$

Where Δ represents the first difference operator, $\mathbf{a_0}$ is the drift component and $\boldsymbol{\mu_t}$ is the white noise residual. The $\boldsymbol{\delta_s}$ represents the long run coefficient to be estimated when the $\boldsymbol{\eta_s}$ represents short-run coefficients of the respective variables in the model. This study test the null hypothesis of cointegration H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ against the alternative hypothesis $H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$.

For objective four, the ARDL model of equation (8) is specified as;

$$\Delta lnRGDP = a_0 + \sum_{i=1}^{a} \lambda_1 \Delta lnRGDP_{t-i} + \sum_{i=0}^{b} \lambda_2 \Delta lnWAT_{t-i} + \sum_{i=0}^{c} \lambda_3 \Delta lnFD_{t-i} + \sum_{i=0}^{d} \lambda_4 \Delta lnINR_{t-i} + \alpha_1 lnRGDP_{t-i} + \alpha_2 lnWAT_{t-i} + \alpha_3 lnINT_{t-i} + \alpha_4 lnINR_{t-i} + \mu_t \quad (12)$$

Where Δ represents the first difference operator, $\mathbf{a_0}$ is the drift component and $\boldsymbol{\mu_t}$ is the white noise residual. The $\boldsymbol{\alpha_s}$ represents the long run coefficient to be estimated when the $\boldsymbol{\lambda_s}$ represents short-run coefficients of the respective variables in the model. This study test the null hypothesis of cointegration H_0: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$ against the alternative hypothesis H_1:$\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0$.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction

The analysis of this chapter is divided into seven sections. Section 4.2 contains the results of the unit root, lag length criteria and co-integration tests. Section 4.3 depicts the empirical results on the growth implication of road transportation in Nigeria. While section 4.4 reveals the empirical results on the impact of rail transportation on economic growth, Section 4.5 examines the empirical effect of airway transportation Nigeria economy. Section 4.6 shows the empirical result on the impact of waterway transportation on economic growth in Nigeria. This chapter is concluded with section 4.7 which presents the summary of the discussion of the results.

4.2 Results of Unit Root, Lag Length Selection Criteria and Co-Integration Tests

4.2.1 Unit Root Test Results

As a preliminary step, before detailed estimations of equations 9, 10, 11 and 12 were undertaken, the study applied Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests to ascertain the order of integration of the variables under consideration. This is important because most macroeconomics time series show a non-stationary behaviour leading to false result of appropriate measures not taken. The ADF and PP results presented in tables 4.1 and 4.2 reveal that all the variables were not stationary at level form, thereby leading to the test of the first difference. The time series data is characterized with different orders of integration a mixture of I(0) and I(1). A closer look at table 4.1 shows that in the case of the ADF test, for intercept only the all the variables are stationary at first difference (i.e lnRGDP, lnRAT, lnAIT, lnWAT, lnGET, lnCUN, lnFDI, lnINT, lnINR, lnEXCHR, lnINF) since their ADF values (test statistic) is less than the critical values at 5 percent for levels and greater than the critical values at 5 percent at first difference implying that they are integrated of order one I(1) while lnRGDP, lnPOP, lnFDI, lnINT and lnINF were stationary at levels that is they are integrated of order zero I(0) which is similar to that of the Phillip and Perron (PP) for intercept only which can be seen in table 4.2.

The result of the ADF test for trend and intercept (i.e. lnRGDP, lnRAT, lnAIT, lnWAT, lnGET, lnCUN, lnFDI, lnINT, lnINR, lnEXCHR, lnINF) were stationary at first difference which suggest that they are integrated of order one I(1) while lnRGDP, lnPOP, lnFDI, lnINT, lnINR, lnINF are stationary at levels which shows that they are integrated of order zero I(0). As regards the PP test for trend and intercept (i.e. lnRGDP, lnROT, lnRAT, lnAIT, lnWAT, lnGET, lnCUN, lnFDI, lnINT, lnINR, lnEXCHR, lnINF) were stationary at first difference, meaning they are integrated of order one I(1) while lnRGDP, lnFDI, lnINT and lnINF were stationary at levels which is they are integrated of order zero I(0).

Table 4.1 : Result of the Augmented Dickey-Fuller (ADF) test

Augmented Dickey-Fuller (ADF) test with Intercept and Trend												
Variable	Level						1st Diff					
	Test Statistics	Critical Values			P-Values	Remarks	Test Statistics	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
lnRGDP	-5.65	-4.157	-3.504	-3.182	0.0001	I(0)	-10.58	-4.16	-3.506	-3.183	0.0000	I(1)
lnROT	2.195	-4.157	-3.504	-3.182	1.0000	NS	-1.916	-4.16	-3.506	-3.183	0.6266	NS
lnRAT	-2.65	-4.157	-3.504	-3.182	0.2592	NS	-6.734	-4.16	-3.506	-3.183	0.0000	I(1)
lnAIT	-2.34	-4.157	-3.504	-3.182	0.4040	NS	-7.584	-4.16	-3.506	-3.183	0.0000	I(1)
lnWAT	-2.05	-4.157	-3.504	-3.182	0.5571	NS	-6.747	-4.16	-3.506	-3.183	0.0000	I(1)
lnGET	-2.11	-4.161	-3.504	-3.182	0.5270	NS	-4.861	-4.16	-3.506	-3.183	0.0014	I(1)
lnCUN	-1.83	-4.157	-3.504	-3.182	0.6725	NS	-8.107	-4.16	-3.506	-3.183	0.0000	I(1)
lnPOP	-4.21	-4.212	-3.504	-3.182	0.0100	I(0)	0.541	-4.16	-3.506	-3.183	0.9991	NS
lnFDI	-4.15	-4.157	-3.504	-3.182	0.0102	I(0)	-9.54	-4.16	-3.506	-3.183	0.0000	I(1)
lnINT	-6.14	-4.157	-3.504	-3.182	0.0000	I(0)	-4.784	-4.16	-3.506	-3.183	0.0022	I(1)
lnINR	-4.09	-4.157	-3.504	-3.182	0.0127	I(0)	-3.189	-4.16	-3.506	-3.183	0.0988	I(1)
lnEXCHR	-1.32	-4.161	-3.504	-3.182	0.8706	NS	-5.16	-4.16	-3.506	-3.183	0.0006	I(1)
lnINF	-5.26	-4.205	-3.504	-3.182	0.0006	I(0)	-7.836	-4.16	-3.506	-3.183	0.0000	I(1)

Augmented Dickey-Fuller (ADF) test with intercept only												
Variable	Level						1st Diff					
	Test Statistics	Critical Values			P-Values	Remarks	Test Statistics	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
lnRGDP	-5.63	-3.571	-2.922	-2.599	0.0000	I(0)	-10.63	-3.57	-2.924	-2.6	0.0000	I(1)
lnROT	2.181	-3.571	-2.922	-2.599	0.9999	NS	-1.319	-3.57	-2.924	-2.6	0.6110	NS
lnRAT	-2.54	-3.571	-2.922	-2.599	0.1116	NS	-6.777	-3.57	-2.924	-2.6	0.0000	I(1)
lnAIT	-2.37	-3.571	-2.922	-2.599	0.1560	NS	-7.668	-3.57	-2.924	-2.6	0.0000	I(1)
lnWAT	-0.69	-3.571	-2.922	-2.599	0.8402	NS	-6.808	-3.57	-2.924	-2.6	0.0000	I(1)
lnGET	-0.91	-3.571	-2.922	-2.599	0.7774	NS	-4.872	-3.57	-2.924	-2.6	0.0002	I(1)
lnCUN	-1.09	-3.571	-2.922	-2.599	0.7117	NS	-8.062	-3.57	-2.924	-2.6	0.0000	I(1)
lnPOP	-4.18	-3.571	-2.922	-2.599	0.0022	I(0)	-1.224	-3.57	-2.924	-2.6	0.6542	NS
lnFDI	-4.19	-3.571	-2.922	-2.599	0.0017	I(0)	-9.651	-3.57	-2.924	-2.6	0.0000	I(1)
lnINT	-5.49	-3.571	-2.922	-2.599	0.0000	I(0)	-4.84	-3.57	-2.924	-2.6	0.0003	I(1)
lnINR	-1.41	-3.571	-2.922	-2.599	0.5703	NS	-5.607	-3.57	-2.924	-2.6	0.0000	I(1)
lnEXCHR	2.101	-3.571	-2.922	-2.599	0.9999	NS	-4.704	-3.57	-2.924	-2.6	0.0004	I(1)
lnINF	-6.63	-3.571	-2.922	-2.599	0.0000	I(0)	-8.665	-3.57	-2.924	-2.6	0.0000	I(1)

Source: Author's computation using E-Views 10 (2021)

Table 4.2: Result of the Phillip-Perron(PP) test.

	Phillips - Perron (PP) test with Trend and Intercept											
Variable	Level						1st Diff					
	Test statistic	Critical Values			P-Values	Remarks	Test statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
lnRGDP	-5.65	-4.157	-3.5	-3.18	0.0001	I(0)	-11.9	-4.16	-3.51	-3.18	0.0000	I(1)
lnROT	-1.08	-4.157	-3.5	-3.18	0.9215	NS	-13.1	-4.16	-3.51	-3.18	0.0000	I(1)
lnRAT	-2.63	-4.157	-3.5	-3.18	0.2699	NS	-7.33	-4.16	-3.51	-3.18	0.0000	I(1)
lnAIT	-2.34	-4.157	-3.5	-3.18	0.4040	NS	-7.61	-4.16	-3.51	-3.18	0.0000	I(1)
lnWAT	-2.07	-4.157	-3.5	-3.18	0.5495	NS	-6.79	-4.16	-3.51	-3.18	0.0000	I(1)
lnGET	-1.88	-4.157	-3.5	-3.18	-3.1818	NS	-4.86	-4.16	-3.51	-3.18	0.0014	I(1)
lnCUN	-1.78	-4.157	-3.5	-3.18	0.6997	NS	-8.1	-4.16	-3.51	-3.18	0.0000	I(1)
lnPOP	-2.74	-4.157	-3.5	-3.18	0.2245	NS	-2.65	-4.16	-3.51	-3.18	0.2594	NS
lnFDI	-4.15	-4.157	-3.5	-3.18	0.0102	I(0)	-22.3	-4.16	-3.51	-3.18	0.0000	I(1)
lnINT	-6.37	-4.157	-3.5	-3.18	0.0000	I(0)	-38.6	-4.16	-3.51	-3.18	0.0000	I(1)
lnINR	-2.58	-4.157	-3.5	-3.18	0.2897	NS	-6.32	-4.16	-3.51	-3.18	0.0000	I(1)
lnEXCHR	-0.75	-4.157	-3.5	-3.18	0.9635	NS	-4.89	-4.16	-3.51	-3.18	0.0013	I(1)
lnINF	-6.79	-4.157	-3.5	-3.18	0.0000	I(0)	-41.3	-4.16	-3.51	-3.18	0.0000	I(1)
	Phillips - Perron (PP) with intercept only											
Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remanrk	Test Statistic	Critical Values			P-values	Remarks
		1%	5%	10%				1%	5%	10%		
lnRGDP	-5.64	-3.571	-2.92	-2.6	0.0000	I(0)	-11.7	-3.57	-2.92	-2.6	0.0000	I(1)
lnROT	5.701	-3.571	-2.92	-2.6	1.0000	NS	-9.89	-3.57	-2.92	-2.6	0.0000	I(1)
lnRAT	-2.53	-3.571	-2.92	-2.6	0.1154	NS	-7.26	-3.57	-2.92	-2.6	0.0000	I(1)
lnAIT	-2.37	-3.571	-2.92	-2.6	0.1560	NS	-7.7	-3.57	-2.92	-2.6	0.0000	I(1)
lnWAT	-0.62	-3.571	-2.92	-2.6	0.8562	NS	-6.85	-3.57	-2.92	-2.6	0.0000	I(1)
lnGET	-0.79	-3.571	-2.92	-2.6	0.8141	NS	-4.87	-3.57	-2.92	-2.6	0.0002	I(1)
lnCUN	-1.02	-3.571	-2.92	-2.6	0.7405	NS	-8.01	-3.57	-2.92	-2.6	0.0000	I(1)
lnPOP	-2.78	-3.571	-2.92	-2.6	0.0679	I(0)	-2.53	-3.57	-2.92	-2.6	0.1157	NS
lnFDI	-4.19	-3.571	-2.92	-2.6	0.0017	I(0)	-22.6	-3.57	-2.92	-2.6	0.0001	I(1)
lnINT	-5.5	-3.571	-2.92	-2.6	0.0000	I(0)	-38.7	-3.57	-2.92	-2.6	0.0001	I(1)
lnINR	-1.38	-3.571	-2.92	-2.6	0.5847	NS	-6.16	-3.57	-2.92	-2.6	0.0000	I(1)
lnEXCHR	2.205	-3.571	-2.92	-2.6	0.9999	NS	-4.66	-3.57	-2.92	-2.6	0.0004	I(1)
lnINF	-6.63	-3.571	-2.92	-2.6	0.0000	I(0)	-38.6	-3.57	-2.92	-2.6	0.0001	I(1)

Source : Author's Computation Using E-View 10(2021)

4.2.2. Lag Length Selection Criteria Results

After the stationary conditions of the variables employed have been determined, to avoid problems of misspecification and loss of degrees of freedom, it is necessary to determine the appropriate lag length incorporated in equation 9, 10, 11 and 12. Following the literature, VAR lag order selection criteria attributed to Hannan-Quinn information criteria (HQ), Final Prediction Error (FPE), Log Likelihood (LL), Akaike information criteria (AIC) and the Schwarz information criteria (SC) were considered. The results presented in tables 4.3, 4.4, 4.5 and 4.6 show the optimum lag structure for the VAR for objectives 1, 2, 3 and 4. As can be observed from tables, the results show that all selection criteria selected the optimum lag length of 2 for ARDL model 9 and 11. The table also shows the selected optimum lag length of 1 for ARDL model 10 and 12.

Table 4.3: Lag Length Selection Criteria Results for Objective 1

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2074.7	NA	4.85e+32	86.61238	86.76831	86.67131
1	-1866.32	373.3401	1.61e+29	78.59672	79.37639*	78.89136
2	-1839.78	43.13359*	1.05e+29*	78.15740*	79.56080	78.68774*

Source: Author's Computation using E-views 10 (2021)

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information

Table 4.4: Lag Length Selection Criteria Results for Objective 2

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-841.476	NA	2.34e+10	35.22817	35.38411	35.28710
1	-731.517	197.0105*	4.68e+08*	31.31320*	32.09287*	31.60784*
2	-722.324	14.93796	6.31e+08	31.59684	33.00024	32.12719

Source: Author's Computation using E-views 10 (2021)

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information

Table 4.5: Lag Length Selection Criteria Results for Objective 3

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-365.6039	NA	57.32175	15.40016	15.55610	15.45909
1	-282.7538	148.4399	3.547582	12.61474	13.39441	12.90938
2	-215.6347	109.0685*	0.427941*	10.48478*	11.88818*	11.01513*

Source: Author's Computation using E-views 10 (2021)

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 4.6: Lag Length Selection Criteria Results for Objective 4

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-989.5603	NA	1.77e+14	44.15824	44.31883	44.21810
1	-876.1508	201.6169*	2.34e+12*	39.82892*	40.63189*	40.12826*
2	-870.6101	8.865047	3.79e+12	40.29378	41.73911	40.83259

Source: Author's Compilation using E-views 10 (2021)

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

4.2.3 Cointegration Test Results

Having determined the optimal lag length, the co-integration relationship among the variables is ascertained. To this end, the study applied bounds test procedure to equations 7,8, 9 and 10. Due to the limitations of the conventional Wald-test F-statistics, Pesaran and Shin (1995, 1998) suggested two critical values (lower and upper bound) to examine the relationship. If the computed F-statistic is lower than the lower bound I(0), the null is not rejected but if the computed F-statistic is greater than the upper bound I(1), it implies that there exists a long run relationship among the variables. However, if the computed F-statistics lies between the lower bound and upper bound, the long run association between the variables are inconclusive. The results of the bound test is shown in table 4.7, 4.8, 4.9 and 4.10.

As can be seen from the table 4.7, at 5 percent level of significance, the study rejects the null hypothesis of no long run relationship among the examined variables that is in objective one, the F- statistics (5.590715) is greater than the upper bound value (3.67). In table 4.8, at 5 percent level of significance, the study rejects the null hypothesis of no long run relationship among the examined variables that is in objective two, the F-statistics (10.97967) is greater than the upper bound value (3.67). From table 4.9, at 5 percent level of significance, the study rejects the null hypothesis of no long run relationship among the examined variables that is in objective three, the F-statistics (7.467980) is greater than the upper bound value (3.67). Table 4.10 shows that the study rejects the null hypothesis of no long run relationship among the examined variables that is in objective four, the F-statistics

(7.259374) is greater than the upper bound value (3.67). This empirical evidence rules out the possibility of estimated relationship being false.

Table 4.7: Results of Bound Test Approach to Co-integration for Objective 1

Significance	Critical Value Bounds		Computed F-statistic
	Lower Bound I(0)	Upper Bound I(1)	
10%	2.37	3.2	
5%	2.79	3.67	5.590715
2.5%	3.15	4.08	
1%	3.65	4.66	

Source: Author's Computation using E-view 10 (2021)

Table 4.8: Results of Bound Test Approach to Co-integration for Objective 2

Significance	Critical Value Bounds		Computed F-statistic
	Lower Bound I(0)	Upper Bound I(1)	
10%	2.37	3.2	
5%	2.79	3.67	10.97967
2.5%	3.15	4.08	
1%	3.65	4.66	

Source: Author's Computation using E-view 10 (2021)

Table 4.9: Results of Bound Test Approach to Co-integration for Objective 3

Significance	Critical Value Bounds		Computed F-statistic
	Lower Bound I(0)	Upper Bound I(1)	
10%	2.37	3.2	
5%	2.79	3.67	7.467980
2.5%	3.15	4.08	
1%	3.65	4.66	

Source: Author's Computation using E-view 10 (2021)

Table 4.10: Results of Bound Test Approach to Co-integration for Objective 4

Significance	Critical Value Bounds		Computed F-statistic
	Lower Bound I(0)	Upper Bound I(1)	
10%	2.37	3.2	
5%	2.79	3.67	7.259374
2.5%	3.15	4.08	
1%	3.65	4.66	

Source: Author's Computation using E-view 10 (2021)

4.3 Empirical Results on the Growth Implication of Road Transportation

4.3.1 Long-Run Impact of Road Transportation on Economic Growth.

Table 4.11 presents the results of the long run impact of road transportation on economic growth. The table shows that road transportation has a positive but statistically insignificant impact on economic growth. Ceteris paribus, a one percent increase in road transportation causes a 0.000924 percent increase in economic growth in the long run. Road transportation positively influences economic growth by instigating economic and social advantages, resulting in positive multiplier effects such as increased market accessibility, employment and investment. This finding is in line with the findings of Nela, Helga and Petra (2019).

Furthermore, the result reveals that government expenditure has a negative but statistically insignificant relationship with economic growth. Specifically, in the long run, holding other things constant, a one percent change in government expenditure will decrease GDP by 2.7 percent. This implies that government expenditure on transportation (GET) has a negative impact on economic growth in Nigeria. Because capital expenditure is one of the pillars of economic growth, the fact that it is not significant suggests that the government has not put in enough effort. This finding is in line with the findings of Mustapha Yusufu, Sunday Elijah and Muhammad Usaini (2018) and contradicts Adelegan (2000).

Further, the result disclose that capital utilization has a positive but statistically insignificant effect on economic growth. Thus, a one percent increase in capital utilization will increase economic growth by 0.013236 percent. This finding contradicts the work of Mustafa Turhan (2018).

From the findings in the table, coefficients of Gross Domestic Products for previous years are positive but statistically insignificant indicating that there are incentives for economic growth in Nigeria. According to the result, holding all other variables constant, a percent increase in in RGDP for previous year will increase economic growth of present year by 0.029707 and 0.18796 percent respectively. This finding agrees with that of Olasode and Babatunde (2016).

Finally, as seen in the result, capital utilization from previous depicts a negative and insignificant relationship with economic growth of present year. Hence, a one percent increase in capital utilization will depress economic growth by 0.00357 and 0.005863 percent respectively, ceteris paribus. This is probably due to the fact of inadequate utilization of capital. This result is in alliance with the findings of Steve Nicolas (2021).

Also, the R^2, the adjusted R^2, the F-statistic, the probability of the F-statistic and the Durbin-Watson statistic for the selected model is shown in panel B of the table 4.11. As shown from the result presented in the table, the explanatory power (R^2) is low (0.348852). This implies that the proportion of variation in economic growth measured by log of real GDP that is jointly explained by road transportation, government expenditure and capital utilization is about 35 percent. Further, the Adjusted R^2 which implies the proportion of variation in economic growth that is measured by log of real GDP jointly explained by the explanatory variables after the effect insignificant repressor has been removed, is about 23 percent.

Furthermore, the F-statistic used in measuring the overall significance of the estimated model is significant at 3.061421 with probability value 0.011200. These indicates that the rate of natural increase in road transportation, government expenditure and capital utilization are significant determinants of economic growth in Nigeria. This reinforces the fact that the results reported are policy significant. Besides, the Durbin-Watson statistic which is used to test for autocorrelation of residuals in the model particularly the first order autocorrelation indicates the absence of serial autocorrelation at 2.065322.

4.3.2 Short-Run Impact of Road Transportation on Economic Growth

Table 4.12 presents the results of the short run impact of economic growth. The table shows that the Error Correction Term (ECT) is negative and statistically insignificant. In essence, the speed of adjustment implied by the coefficient of ECT suggests that the deviation from short run to long run is corrected by 41 percent each year. Therefore, there is no stable long run relationship among real GDP, road transportation, government expenditure and capital utilization.

Additionally, the result reveals that road transportation is negative but statistically insignificant in previous years. Ceteris paribus, a one percent increase in road transportation causes a 0.002507 and 0.002775 percent decrease in economic growth respectively. The estimated short-run model revealed that it is contrary to its long-run model.

From the findings in the table, government expenditure has a positive and negative but statistically insignificant impact on economic growth in previous years. All things being equal, a one percent increase in government expenditure will result to an 8.01 and 6.60 percent change in economic growth respectively. The estimated short-run model revealed that it is in line with its long-run model.

Finally, the result shows that capital utilization has a positive but statistically insignificant effect on economic growth in previous years. A one percent increase in capital utilization will lead to a 0.001594 and 0.004307 percent decrease in economic growth respectively. This finding of the short-run is in line with the finding of the long-run of this model.

Table 4.11: Estimated Long-Run Dynamics Results for the selected ARDL (2,0,0,2)

Long-Run for Objective one

Regressand: DRGDP				
Panel A: Long-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP(-1)	0.029707	0.151182	0.196497	0.8452
RGDP(-2)	0.18796	0.12182	1.542932	0.1307
ROT	0.000924	0.00055	1.680810	0.1006
GET	-2.71E-10	1.84E-10	-1.47111	0.1491
CUN	0.013236	0.004027	3.286902	0.0021
CUN(-1)	-0.00357	0.004233	-0.843224	0.4041
CUN(-2)	-0.005863	0.003467	-1.690931	0.0986
C	2.990905	1.286914	2.3240900	0.0253
Panel B: Goodness-of-fit Measures				
R^2			0.348852	
$Adjusted\ R^2$			0.234901	
F-statistic			3.061421	
Prob(F-statistic)			0.011200	
Durbin-Watson stat			2.065322	

Source: Author's Computation from E-views 10 (2021)

Table 4.12: Estimated Short Run Dynamics Test Result for Objective One

Regressand: DRGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.316595	2.511979	0.126034	0.9004
D(RGDP(-1))	-0.367125	0.211415	-1.736515	0.0908
D(RGDP(-2))	-0.239599	0.157099	-1.525147	0.1357
D(ROT(-1))	-0.002507	0.00953	-0.263045	0.794
D(ROT(-2))	-0.002775	0.009411	-0.294902	0.7697
D(GET(-1))	8.01E-11	3.27E-10	0.245061	0.8078
D(GET(-2))	-6.60E-12	3.73E-10	-0.017669	0.986
D(CUN(-1))	0.001592	0.005182	0.307214	0.7604
D(CUN(-2))	0.004307	0.004839	0.889985	0.3792
ECT(-1)	-0.410318	0.252121	-1.627464	0.1121

Source: Author's computation using E-views 10 (2021)

4.4 Empirical Results on the Impact of Railway Transportation on Growth

4.4.1 Long Run Impacts on Railway Transportation on Economic Growth

Table 4.13 presents the results of the long run impact of railway transportation on economic growth. The table shows that railway transportation has a negative and statistically significant impact on economic growth. Ceteris paribus, a 1 percent increase in railway transportation causes a 0.190463 percent decrease in economic growth in the long run. When transport systems are deficient in terms of capacity or reliability, they can have economic costs such as lower quality of life and reduced opportunities. At the aggregate level, inefficient transportation increases costs in many economic sectors, leading to a decreased economic growth. This finding is accordance with the work of Lingaitis and Gintaras (2013).

From the table, the coefficient of railway transportation of previous year indicate that there is a positive and statistically insignificant relationship between railway transportation and economic growth. A one percent increase in railway transportation will positively influence growth by 0.136894 percent. This implies that in the previous year, transport system were more efficient and reliable.

The table also show that exchange rate has a negative and statistically significant effect on economic growth, indicating that it has an important influence on growth. Thus, ceteris paribus, a one percent increase in exchange rate causes a 0.083573 percent decrease in economic growth. This is because in developing countries like Nigeria, the input structure of production depends on imported capital and intermediate goods, thus, an increase in exchange rates makes import production input more expensive, thereby negatively affecting economic growth. This finding opposes the work of Ozcan Karahan (2020) whose findings suggested that exchange rate positively influences economic growth.

This is not the case for the exchange rate of previous year. The result shows a positive but statistically insignificant relationship between exchange rate of the previous year and economic growth of present year. This implies that a one percent increase in exchange rate of previous year will improve economic growth by 0.083573. This result is consistent with the findings of Ozcan Karahan (2020).

The table depicts that inflation has a negative and statistically significant effect on economic growth. A one percent change in inflation will lead to a 0.075403 percent change in economic growth. According to researchers, high inflation puts pressure on a government to increase the value of the state pension and unemployment benefit including other welfare payments as the cost of living climbs higher. The government revenue available for economic-growth-activities reduces leading to a decrease in economic growth. This finding goes in line with the findings of Fikirte Tsegaye Mamo (2012).

From the findings in the table, coefficient of Gross Domestic Products for previous year has a negative and statistically insignificant relationship with growth. According to the result, holding all other variables constant, a percent increase in in RGDP for previous year will decrease economic growth of present year by 0.004662 percent. This finding contradicts that of Olasode and Babatunde (2016).

Likewise, depicts negative relationships with economic growth of present year. Hence, a one percent increase in inflation rate from previous years will depress economic growth of present year by 0.00357 and 0.005863 percent respectively, ceteris paribus.

Also, the R^2, the adjusted R^2, the F-statistic, the probability of the F-statistic and the Durbin-Watson statistic for the selected model is shown in panel B of the table 4.13. As shown from the result presented in the table, the explanatory power (R^2) is high (0.512355). This implies that the proportion of variation in economic growth measured by log of real GDP that is jointly explained by railway transportation, exchange rate and inflation is about 51 percent. Further, the Adjusted R^2 which implies the proportion of variation in economic growth that is measured by log of real GDP jointly explained by the explanatory variables after the effect insignificant repressor has been removed, is about 41 percent.

Furthermore, the F-statistic used in measuring the overall significance of the estimated model is significant at 5.122031 with probability value 0.0002. These indicates that the rate of natural increase in road transportation, government expenditure and capital utilization are significant determinants of economic growth in Nigeria. This reinforces the fact that the results reported are policy significant. Besides, the Durbin-Watson statistic which is used to test for autocorrelation of residuals in the model particularly the first order autocorrelation indicates the absence of serial autocorrelation at 2.163934.

4.4.2 Short-Run Impact of Railway Transportation on Economic Growth

Table 4.14 presents the results of the short run impact of economic growth. The table shows that the Error Correction Term (ECT) is negative and statistically significant. In essence, the speed of adjustment implied by the coefficient of ECT suggests that the deviation from short run to long run is corrected by 76.9 percent each year. Therefore, there is a stable long run relationship among real GDP, railway transportation, exchange rate and inflation.

Additionally, the result reveals that railway transportation is positive but statistically insignificant. Ceteris paribus, a one percent increase in railway transportation causes a 0.047179 percent increase in economic growth. When transportation systems are efficient, they give economic and social possibilities and advantages, resulting in positive multiplier effects such as increased market accessibility, employment, and investment. The estimated short-run model revealed that it is in line with the long-run model.

From the findings in the table, exchange rate has a positive but statistically insignificant impact on economic growth. All things being equal, a one percent increase in exchange rate will result to a 0.022106 percent change in economic growth. Increases in exchange rates improve net export volume, which has a positive impact on economic growth due to rising overall demand. The estimated short-run model revealed that it is contrary to its long-run model.

Finally, the result shows that inflation has a positive but statistically insignificant effect on economic growth. A one percent increase in inflation will lead to a 0.02773 percent increase in economic growth. Other forces can lead prices to change significantly in the near term. This finding of the short-run is contrary with the finding of the long-run of this model.

Table 4.13: Estimated Long-Run Dynamics Results for the selected ARDL (1,1,1,2)

Long-Run for Objective two

Regressand: DRGDP				
Panel A: Long-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP(-1)	-0.004662	0.135595	-0.034381	0.9727
RAT	-0.190463	0.081999	-2.32276	0.0255
RAT(-1)	0.136894	0.079716	1.717285	0.0939
EXCHR	-0.083573	0.041833	-1.997799	0.0527
EXCHR(-1)	0.082209	0.045062	1.824338	0.0758
INF	-0.075403	0.019501	-3.866526	0.0004
INF(-1)	-0.047364	0.021966	-2.156287	0.0373
INF(-2)	-0.05944	0.020253	-2.934827	0.0056
C	197.3261	236.1455	0.835612	0.4085
Panel B: Goodness-of-fit-Measures				
R^2			0.512355	
Adjusted R^2			0.412326	
F-statistic			5.122031	
Prob(F-statistic)			0.000212	
Durbin-Watson stat			2.163934	

Source: Author's Computation from E-views 10 (2021)

Table 4.14: Estimated Short Run Dynamics Test Result for Objective Two

Regressand: DRGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.724956	0.85821	-0.84473	0.403
D(RGDP(-1))	-0.067966	0.148206	-0.458591	0.6489
D(RAT(-1))	0.047179	0.098153	0.480665	0.6332
D(EXCHR(-1))	0.022106	0.050204	0.440329	0.662
D(INF(-1))	0.02773	0.019571	1.416861	0.1639
ECT(-1)	-0.769954	0.199995	-3.849861	0.0004

Source: Author's computation using E-views 10 (2021)

4.5 Empirical Results on the Effect of Airway Transportation on Growth

4.5.1 Long Run Effect of Airway Transportation on Economic Growth

Table 4.15 presents the results of the long run impact of airway transportation on economic growth. The result reveals that the impact of airway transportation on economic growth is negative and statistically insignificant. A one percent increase in airway transportation will lead to a decrease of 0.15268 percent in RGDP. From the result, airway transportation negative contribution to Gross Domestic Product could be due to the absence of a coherent air transport policy, bad management, decaying facilities, loose security, closure of airports, intermittent air crashes, among others. This finding contradicts the findings of NuriBaltaci, OzlemSekmen and GizemAkbulut (2015).

Moreover, the table suggests that population growth is an important determinant of economic growth. The result shows that the relationship between population and economic growth is negative and statistically insignificant in the long run. A one percent increase in population growth will lead to a 45.3 percent increase in economic growth. When the population growth exceeds the growth of national income, it outstrips economic growth. This finding opposes the findings of Jacob Pegou Sibe, Cesaire Chlatchoua and Marie Noel Megne (2016).

Moreso, the results show that Foreign Direct Investment (FDI) has a negative and statistically insignificant relationship with economic growth. Hence, a one percent increase in Foreign Direct Investment will decrease economic growth by 0.851257 percent. While FDI may not have a significant impact on economic growth, the impact of the component of FDI is quite significant and growth inducing. However, according to the result, the FDI is not growth inducing, suggesting the existence of unconducive business climate for manufacturers. This finding opposes the findings of Herzer, Dierk (2010).

The result depicts that the foreign direct investment of previous years has a positive and statistically insignificant relationship with economic growth of present year. A one percent increase of FDI of previous years will increase economic growth of present year by 1.177576 percent, agreeing with the findings of Herzer, Dierk (2010).

From the findings in the table, coefficients of population for previous years depicts both a positive and a negative insignificant relationship with economic growth. According to the result, holding all other variables constant, a percent increase in population for previous years will increase economic growth of present year by 108.0364 and decrease it by 75.55664 percent respectively. This finding partially agrees with that of Olasode and Babatunde (2016).

Also, the R^2, the adjusted R^2, the F-statistic, the probability of the F-statistic and the Durbin-Watson statistic for the selected model is shown in panel B of the table 4.15. As shown from the result presented in the table, the explanatory power (R^2) is low (0.315452). This implies that the proportion of variation in economic growth measured by log of real GDP that is jointly explained by road transportation, government expenditure and capital utilization is about 31 percent. Further, the Adjusted R^2 which implies the proportion of variation in economic growth that is measured by log of real GDP jointly explained by the explanatory variables after the effect insignificant repressor has been removed, is about 20 percent.

Furthermore, the F-statistic used in measuring the overall significance of the estimated model is significant at 2.63324 with probability value 0.024567. These indicates that the rate of natural increase in airway transportation, population and foreign direct investment are significant determinants of economic growth in Nigeria. This reinforces the fact that the results reported are policy significant. Besides, the Durbin-Watson statistic, which is used to test for autocorrelation of residuals in the model particularly the first order autocorrelation, indicates the absence of serial autocorrelation at 1.932652.

4.5.2 Short-Run Effect of Airway Transportation on Economic Growth

Table 4.16 presents the results of the short run impact of economic growth. The table shows that the Error Correction Term (ECT) is negative and statistically insignificant. In essence, the speed of adjustment implied by the coefficient of ECT suggests that the deviation from short run to long run is corrected by 40.5 percent each year. Therefore, there is no stable long run relationship among real GDP, airway transportation, population and foreign direct investment.

Additionally, the result reveals that airway transportation is positive and negative but statistically insignificant in previous years. Ceteris paribus, a one percent increase in airway transportation causes a 0.20417 and 0.060428 percent decrease in economic growth respectively. The estimated short-run model revealed that it is in line with the long-run model.

Moreover, the table suggests that population has both positive and negative but statistically insignificant impact on economic growth. All things being equal, a one percent increase in population will result to a 40.80679 and 31.47633 percent decrease in economic growth respectively. The estimated short-run model revealed that it is in line with the long-run model.

Finally, the result shows that foreign direct investment has a positive and negative but statistically insignificant effect on economic growth. A one percent increase in foreign direct investment will result to a 0.562083 and 0.562694 percent increase in economic growth. This finding of the short-run is contrary with the finding of the long-run of this model.

Table 4.15: Estimated Long-Run Dynamics Results for the selected ARDL (1,0,2,1)

Long-Run for Objective three

Regressand: DRGDP				
Panel A: Long-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
AIT	-0.015268	0.094253	-0.161989	0.8721
POP	-45.38327	46.07704	-0.984943	0.3306
POP(-1)	108.0364	84.90156	1.27249	0.2105
POP(-2)	-75.55664	47.22967	-1.599771	0.1175
FDI	-0.851257	0.719801	-1.182628	0.2439
FDI(-1)	1.177576	0.742166	1.586674	0.1205
C	36.09585	25.66589	1.406374	0.1673
Panel B: Goodness-of-fit-Measures				
R^2			0.315452	
$Adjusted\ R^2$			0.195656	
F-statistic			2.63324	
Prob(F-statistic)			0.024567	
Durbin-Watson stat			1.932652	

Source: Author's Computation from E-views 10 (2021)

Table 4.16: Estimated Short Run Dynamics Test Result for Objective Three

Regressand: DRGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.357427	0.804973	-0.444024	0.6596
D(RGDP(-1))	-0.353908	0.185947	-1.903271	0.0648
D(RGDP(-2))	-0.237132	0.141014	-1.681616	0.1011
D(AIT(-1))	-0.20417	0.131983	-1.546943	0.1304
D(AIT(-2))	-0.060428	0.137071	-0.440854	0.6619
D(POP(-1))	40.80679	29.65412	1.376091	0.1771
D(POP(-2))	-31.47633	30.28611	-1.039299	0.3054
D(FDI(-1))	0.562083	0.710553	0.79105	0.434
D(FDI(-2))	-0.562694	0.708529	-0.794172	0.4322
ECT(-1)	-0.405493	0.222077	-1.825908	0.0759

Source: Author's computation using E-views 10 (2021)

4.6 Empirical Results on the Impact of Waterway Transportation on Growth

4.6.1 Long Run Impact of Waterway Transportation on Economic Growth

Table 4.17 presents the results of the long run impact of waterway transportation on economic growth. An examination of the result depicts, there is a negative but statistically insignificant long run relationship between waterway transportation and economic growth. A one percent increase in waterway transportation will cause growth to decrease by 5.1 percent. The negative impacts of waterway transportation can be listed as degradation of water resources This finding contradicts the work of Alexandra Fratila, Ioana Andrada Gavril, Sorin Cristian Nita and Andrei Hrebenciuc (2021).

Interest Rate has a positive and statistically significant relationship with Economic Growth, suggesting that a one percent increase in Interest Rate will cause RGDP to increase by 0.130917 percent. This indicates that interest rate appears to be an important determinant of economic growth. They influence the cost of borrowing and the return on savings which makes interest rate an important component of the total return of many investments. This finding contradicts the findings of the work of Abiodun Samuel Ajayi, Olufemi Oladipo, Lawrence Boboye Ajayi and Tony Ikechukwu Nwanji (2017).

Investment rate is negatively but statistically insignificant. All things being equal, a one percent increase in capital formation will reduce RGDP by 0.095585 percent. A decrease in investment would reduce the aggregate demand by an amount. A decrease in investment reduces the stock of capital and the quantity of capital available to an economy. This finding goes in line with the findings of Jeanne G. Gobalet and Larry J. Diamond (1979).

From the findings in the table, coefficients of economic growth for previous years depicts a positive but statistically insignificant relationship. According to the result, holding all other variables constant, a percent increase in economic growth for previous years will increase economic growth of present year by 0.098371 and 0.179357 percent respectively.

Also, the R^2, the adjusted R^2, the F-statistic, the probability of the F-statistic and the Durbin-Watson statistic for the selected model is shown in panel B of the table 4.17. As shown from the result presented in the table, the explanatory power (R^2) is low (0.338406). This implies that the proportion of variation in economic growth measured by log of real GDP that is jointly explained by road transportation, government expenditure and capital utilization is about 34 percent. Further, the Adjusted R^2 which implies the proportion of variation in economic growth that is measured by log of real GDP jointly explained by the explanatory variables after the effect insignificant repressor has been removed, is about 26 percent.

Furthermore, the F-statistic used in measuring the overall significance of the estimated model is significant at 4.1943 with probability value 0.003601. These indicates that the rate of natural increase in waterway transportation, interest rate and investment rate are significant determinants of economic growth in Nigeria. This reinforces the fact that the results reported are policy significant. Besides, the Durbin-Watson statistic, which is used to test for autocorrelation of residuals in the model particularly the first order autocorrelation, indicates the absence of serial autocorrelation at 2.074305.

4.6.2 Short-Run Impact of Waterway Transportation on Economic Growth

Table 4.18 presents the results of the short-run impact of economic growth. The table shows that the Error Correction Term (ECT) has a negative but statistically significant impact. In essence, the speed of adjustment implied by the coefficient of ECT suggests that the deviation from short run to long run is corrected by 80.2 percent each year. Therefore, there is a stable long run relationship among real GDP, waterway transportation, interest rate and investment rate.

Additionally, the result reveals that waterway transportation is positive but statistically insignificant. Ceteris paribus, a one percent increase in waterway transportation causes a 7.95 percent decrease in economic growth. The estimated short-run model revealed that it is contrary to the long-run model.

Moreover, the table suggests that interest rate has a negative but statistically insignificant impact on economic growth. All things being equal, a one percent increase in population will result to a 0.036231 percent decrease in economic growth. The estimated short-run model revealed that it is contrary to the long-run model.

Finally, the result shows that investment rate has a negative but statistically insignificant effect on economic growth. A one percent increase in investment rate will result to a 0.097231 percent decrease in economic growth. This finding of the short-run is in line with the finding of the long-run of this model.

Table 4.17: Estimated Long-Run Dynamics Results for the selected ARDL (2,0,0,0)

Long-Run for Objective four

Regressand: DRGDP				
Panel A: Long-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP(-1)	0.098371	0.138301	0.711283	0.4809
RGDP(-2)	0.179357	0.118721	1.51074	0.1385
WAT	-5.10E-05	7.24E-05	-0.705015	0.4848
INT	0.130917	0.059373	2.204994	0.0331
INR	-0.095585	0.071272	-1.341137	0.1873
C	7.561697	4.366017	1.731944	0.0908
Panel B: Goodness-of-fit-Measures				
R^2			0.338406	
$Adjusted\ R^2$			0.257723	
F-statistic			4.1943	
Prob(F-statistic)			0.003601	
Durbin-Watson stat			2.074305	

Source: Author's Computation from E-views 10 (2021)

Table 4.18: Estimated Short Run Dynamics Test Result for Objective Four

Regressand: DRGDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.851806	0.828821	-1.027733	0.3103
D(RGDP(-1))	-0.132983	0.146217	-0.909495	0.3685
D(WAT(-1))	7.95E-05	0.000169	0.469160	0.6415
D(INT(-1))	-0.036231	0.049449	-0.732691	0.4680
D(INR(-1))	-0.097231	0.163409	-0.595013	0.5552
ECT(-1)	-0.802178	0.175381	-4.573915	0.0000

Source: Author's computation using E-views 10 (2021)

4.7 Discussion of Results

The study examined the impact of transportation on economic growth in Nigeria. Specifically, the growth implication of road transportation, impact of railway transportation on RGDP, effect of airway transportation and impact of waterway transportation were examined.

The analysis on the growth implication of road transportation in Nigeria showed that road transportation has a negative and positive but statistically insignificant effect on economic growth both in the short-run and long-run respectively. Specifically, in the long-run, holding other things constant, a one percent change in road transportation will bring about 0.000924 percent change in real GDP. A change in road transportation will bring about potentials for economic growth and it is an important determinant of growth in per capita income. This finding is in accordance with the findings of Nela, Helga and Petra (2019).

Further, the analysis on the impact of railway transportation showed that railway transportation has positive and negative but statistically significant impact on economic growth both in the short-run and long-run periods respectively. Specifically, in the long-run, holding other things constant, a one percent increase in railway transportation will lead to a 0.190463 percent decrease in economic growth. This could lead to economic deficiency such as lower quality of life, reduced opportunities, among others. This finding goes in line with the findings of Lingaitis and Gintaras (2013).

In addition, the analysis on the effect of airway transportation on Nigerian economy reviewed that airway transportation has a negative but statistically insignificant impact on economic growth in Nigeria both in the short-run and long-run periods. In the long-run, all things being equal, a one percent change in airway transportation will lead to a 0.15268 decrease in RGDP. The negative contribution of airway transportation can be due to bad management, decaying facilities, loose securities, intermittent air crashes, among others. This finding contradicts Gizem, Ozlem and Nuri (2015).

Finally, the analysis on the impact of waterway transportation on economic growth showed that there is a positive and negative but statistically insignificant short-run and long-run impact on economic growth. Ceteris paribus, in the long-run, a one percent change in waterway transportation will lead to a 5.10 decrease in the long-run. This finding contradicts the work of Alexandra, Ioana, Sorin and Andrei (2021).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the findings. It outlines the policy conclusions and recommendations premised on the results of the study. The main contributions to knowledge as well as the limitations of the study together with the suggestions for the future research were also discussed.

5.2 Summary of the Findings

The primary goal of this project was to examine the connection between Nigeria's economic growth and transportation from 1970 to 2019. The growth implication on road transportation has been produced precisely. The research also examined the impact of railway transportation on economic growth in Nigeria. In addition, the effect of airway transportation was analyzed. Finally, the impact of waterway transportation on economic growth in Nigeria was created. The necessary background to the research was laid to accomplish these goals, the issues were recognized and justified accordingly. The research used econometric analytical methods.

Using the Auto-Regressive Distributed Lag Model (ARDL), specific goals 1, 2, 3 and 4 were achieved. The unit root test was estimated to determine the time series of variables included in the study using both the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) test before the ARDL test was conducted. The outcomes of the ADF and PP revealed that most variables were not stationary in level form, leading to the first difference test. After the variables had been determined to be stationary at level or first difference, the

ARDL models lag order was predicted using VAR lag order selection criteria that picked lag 2 for two models (9 and 11) and picked lag 1 for two models (10 and 12). The cointegration relationship between the variables was determined in each ARDL model using the bound test approach after the lag length was selected, which means that there is a long run relationship between the variables. The research then proceeded to assess the long-run and short-run connection between factors using ARDL. The investigation shows no significant impact of transportation on economic growth.

5.3 Conclusion

According to this study, it is concluded that there is no relationship between transportation and economic growth. This research indicated that road, railway, airway and waterway transportation have an adverse and insignificant economic connection to Nigeria's economic growth. However, railway transportation is more preferable to other forms of transportation because it has a positive impact on economic growth.

5.4 Recommendation

From the findings, which have emerged in this study, several recommendations can be deduced. The following recommendations was made after the research findings:

a. The government and its agencies should design and implement policies for transport construction and maintenance that would assure good access to transportation around the country.

b. Increased and encouraged private engagement in the provision of public transportation services is required.

c. Policies governing the regulations and usage of the modes of transportation should be developed and monitored to ensure that its use does not escalate commuter mobility issues.
d. To lower the rate of transportation mode breakdown, transportation company management should ensure that transportation modes undergo routine maintenance.
e. The company is computerized so that the speed limits on the driver can be monitored. This would assist to reduce the number of accidents and improve the company's reputation, and management should provide modern infrastructure and facilities to ensure that passengers are adequately cared for.

5.5 Contribution to Knowledge

Only a few scholars have looked into the impact of the transportation industry on Nigeria's economic growth. The majority of studies focus entirely on the impact of road transportation on economic growth, with alternate forms of transportation receiving minimal attention. As a result, this study fills a knowledge gap by examining the impact of road, rail, air, and water transportation on Nigeria's economic growth.

5.6 Limitations of the Study

This research was subject to certain limitations. There were time constraints and secondary data collection requirements. Because the investigator was unfamiliar with the E-view tool, developing the statistical presentation was a difficult undertaking. This necessitated some software training to ensure that the software could be used effectively to produce the requisite statistical data display.

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