2016

Economic Policy Implications of Port Concession in Nigeria

Chiedu Bertram Ndubisi
Walden University

Walden University

College of Social and Behavioral Sciences

This is to certify that the doctoral dissertation by

Chiedu Bertram Ndubisi

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Matthew Jones, Committee Chairperson,
Public Policy and Administration Faculty

Dr. Marcel Kitissou, Committee Member,
Public Policy and Administration Faculty

Dr. Heather Mbaye, University Reviewer,
Public Policy and Administration Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2016

Abstract

Economic Policy Implications of Port Concession in Nigeria

by

Chiedu Bertram Ndubisi

MBA, Enugu State University of Technology, Nigeria, 1998

BSC, University of Jos, Nigeria, 1982

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Policy and Administration

Walden University

December 2016

Abstract

Previous research on privatization has focused on its effect on output, profitability, investment, and efficiency at the level of the firm, neglecting the economic growth and other impacts. Nigeriaôs port privatization through concession in 2006 covered virtually all the ports in the economy. However, the few studies on the subject neither factored in the complexity that characterize the multiple port system nor controlled for alternative explanations of the changes in the economy. This correlational study tested the property rights theory by investigating whether the changes in production efficiency at the ports following privatization are good predictors of economic growth in Nigeria. Eight years of existing panel data were collected from Nigerian ports, providing 160 observations on several selected variables. The analyses controlled for the influence of confounding or interacting variables and addressed the complexity of the port system using linear programming. The multiple regression analysis showed that privatization, deregulation, cargo increases, interest rate, and inflation rate accounted for high variations in short and long-term economic growth. Port privatization transmitted growth to the economy through cargo throughput increases. The Malmquist linear programming analysis revealed overall but modest improvements in production efficiency changes after the privatization. By isolating possible areas of efficiency improvements, this study may inform port managers in Nigeria on ways to improve overall competitiveness. The potential contribution of the research to social change lies in clearly identifying the critical variables to economic growth in Nigeria to aid economic planning, poverty alleviation and improving the quality of life.

Port Concession in Nigeria: Economic Policy Implications

by

Chiedu Bertram Ndubisi

MBA, Enugu State University of Technology, Nigeria, 1998

BSC, University of Jos, Nigeria, 1982

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Policy and Administration

Walden University

December 2016

Dedication

This doctoral study is dedicated to my wife, Chinwe, who provided me with steadfast support, encouragement, and humor at each stage of my doctoral journey. I also dedicate this work to my children, Ekene, Dumeme, and Chisom. I owe a lot to their understanding and forgiveness for my all-too-frequent absences from the family and family events.

This doctoral study is also dedicated to the memory of my parents, Dr. Bennet Epumdiegwu Chukwudumeme and Mary-Elms Nkemdilim Ndubisi, whom I owe everything, from dedication to my education to my general wellbeing. Additionally, I dedicate my doctoral studies to my brothers Forster and Bennet and their wives, June and Chijindu, who rolled out the red carpet all the times I was in the United States for my residencies. I also dedicate this doctoral work to my other siblings, Uju, Ngozi, and Chioma, and their spouses for being there for me during this trying period. I will also not forget my bosom friend, father, and brother Isa Ozi Salami, at whose urging I started this journey. I also dedicate this study to my cousin Dr. George Udezue and my Bishop Rt. Rev Raphael Okafor, whose words of encouragement kept me focused.

Acknowledgments

There are some people whose commitment was instrumental in my completion of this study in a timely manner. First, my sincere gratitude goes to my committee chair and methodologist, Dr. Jones, for his humanity, professionalism, patience, humility, understanding, and friendship. I wish to thank Drs. Marcel Kitissou and Heather Alecia Denton Mbaye for serving on my committee and providing useful guidance and support at all stages of my doctoral study journey. I will also not forget the significant role of the Dissertation Editor, Carey Little Brown, whose painstaking review greatly enhanced the professional quality of this dissertation.

My gratitude also goes to the various faculty members and instructors who helped to build the foundation for my doctoral study and those staff at the various residencies in New Orleans and Houston. I remember Anthony Fleming, Aman Khan, Glenn Starks, Joyce Haines, and Christopher Jones. I also remember Morris Bidjerano, Asghar Zomorrodian, Roland Bullard, Augusto Ferreros, and Lisa Bryan. Dr. Ronald Craig provided a lot of guidance at the two residences.

In addition, I am exceedingly grateful to all my colleagues at the Infrastructure Concession Regulatory Commission. In this regard, I am particularly grateful to Aminu Diko, Adamu Umar, and Williams Friday for their unfailing support towards the success of this program. I will also not forget the assistance of my former colleagues at the Bureau of Public Enterprise, particularly Benjamin Dikki and Joe Anichebe. I also remember and thank my friends at the Nigerian Ports Authority, namely Joshua Asanga and Richard Ande, for their support during my data gathering efforts.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

Privatization as a policy has existed in one form or another since antiquity. In ancient Greece, the state retained ownership of land, forests, and mines but ceded the provision of services to the private sector. The ancient Romans and Mesopotamians contracted out virtually all services in the state to private individuals and companies. In the Middle Ages, the Catholic Church devised a scheme that allowed landlords and tenant farmers to partner with the state. Although there was a resurgence of privatization during the Industrial Revolution of the 18th century, it was first introduced into the modern economic lexicon in the 1950s, with the privatization of British Steel by Winston Churchill (Parker & Saal, 2003; Yoffee, 2001). The word, however, gained prominence as a policy instrument with the rise of conservative governments in Britain, the United States, and France in the late 1970s and early 1980s (Starr, 1988). This study provides a detailed discussion of the concept, methods, and role of the private sector in portsôlogistics development and their operations in Chapter 2.

Over the past 30 years, countries have implemented privatization policies, intending to structure and stabilize their economies. While the transition economies of Eastern Europe pursued the privatization of their state-owned enterprises (SOEs) as a strategy for transiting quickly from state-controlled to market-driven economies following the disintegration of the former Soviet Union, the countries of subsaharan Africa (SSA) embraced privatization for quite a different reason. The latter adopted privatization at the insistence of the World Bank and the International Monetary Fund (IMF) with the strict implementation of the Structural Adjustment

Program (SAP) as a precondition for the provision of economic relief packages. Economic relief became necessary when the subsaharan African countries faced serious macroeconomic challenges including budgetary constraints, widening current accounts, growing foreign debt, rising inflation, and balance of payment difficulties in the mid-1980s (Al-Obaidan, 2002).

Nigeria is one of the SSA countries that embraced privatization, a policy instrument of the neoliberal growth theory of the early 1980s. According to neoliberal growth theory, the property rights conferred by way of privatization incentivizes the private sector to make a greater investment, intending to achieve higher efficiency gains, better services, increased productivity, and profitability (Tongzon and Heng, 2005). To date, Nigeria has undertaken the privatization of over 167 SOEs in power, telecommunications, financial services, and manufacturing (Chigbue & Bureau of Public Enterprises [BPE], 2007). A total of 24 of Nigeriaôs seaports were among the SOEs privatized by the Nigerian government (Adi, Iheanachor, Ndukwe, & Dim, 2013; Eniola, Njoku, Oluwatosin, & Okoko, 2014; Jaja, 2011; Oghojafor, Kuye, & Alaneme, 2012). As recently as 2012, Nigeria privatized 17 successor companies of its erstwhile electricity monopoly, renowned for its epileptic power supply, brownouts, and blackouts, after a lengthy sectorial reform process.

Apart from the introductory section, there are 12 sections in this introductory chapter to the study. The first section provides background for this study. The section commences with a brief summary of the research literature related to the growth impact of the privatization of ports. The section also presents the literature relevant to the scope of the study topic and describes the knowledge gap I sought to address. The next section presents a statement of the research

problem, including a summary of the evidence of the currency, relevance, and significance of the study to policy analysis. The section also identifies the gap in the literature that the study was intended to address. The third section addresses the purpose of the study; in the fourth section, I present and discuss the research question(s) and hypotheses. The section also identifies the independent and dependent variables of the study, together with the relationship expected and the measurement. The next section introduces the theoretical framework and identifies the theories that underlie the concept of privatization, including their origins and sources, major theoretical propositions, primary hypotheses, and nexus with the study approach and research questions. The section following presents the research design and methodology, along with their justification. The succeeding section provides a concise definition of the variables of the study and the underlying assumptions.

The ensuing section justifies the focus on the aspects of the research problem that the study addressed. This section delimitates the boundaries of the study, the populations examined, and the theoretical framework underlying the study. Additionally, the section addresses the generalizability of the study. In the 10th section, the study identifies the perceived design and methodological limitations; the section that follows identifies, the potential contributions of the study to knowledge in public policy and analysis and the potential implications for positive social change. This chapter concludes with a presentation of the highlights of the chapter, together with a transition to the literature review in Chapter 2.

Background

Nigeria is the most populous country in Africa, with an estimated population of 177.5 million in 2014 (World Bank, 2015). The country lies between Benin Republic, Cameroon, and the Gulf of Guinea on the Atlantic coast of West Africa. Figure 1 shows the location of Nigeria on the world map.

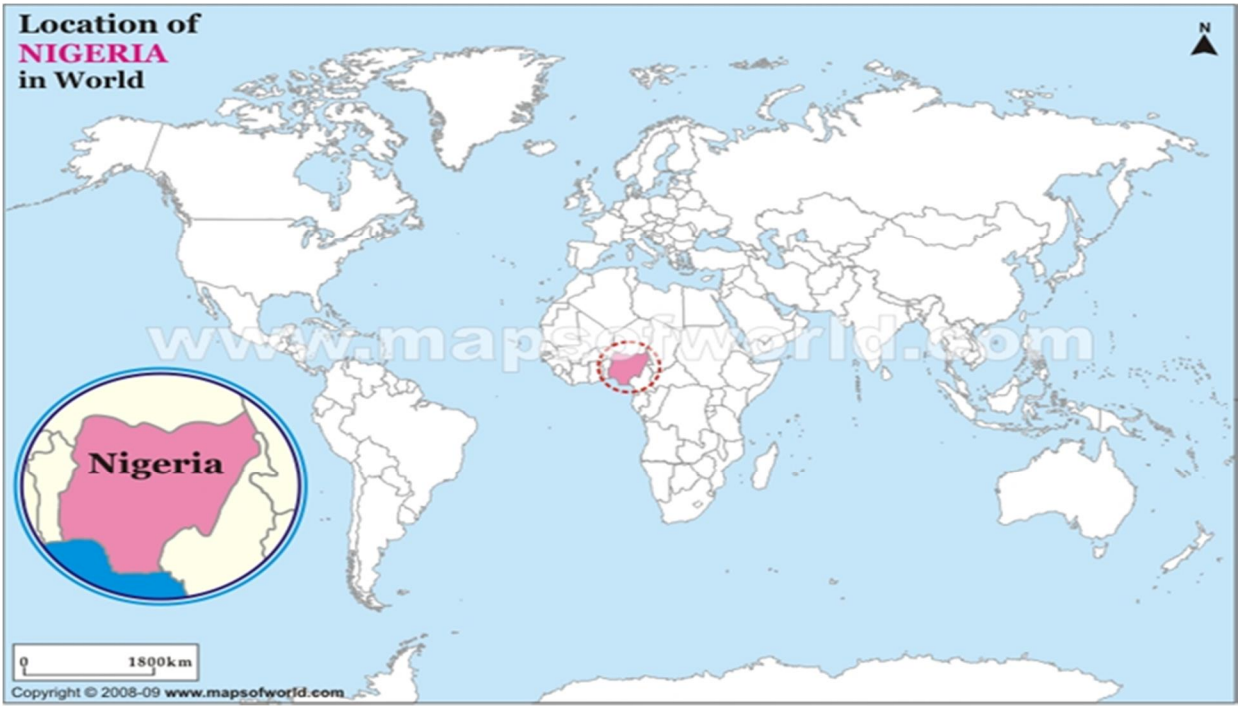

Figure 1. Location of Nigeria in the world. From ñWhere Is Nigeria,ò by Maps of World, 2009 (http://mapsofworld.com). Copyright 2008-2009 by Maps of World.

Until the country rebased its economy in 2011, its economy had grown at an average rate of about 7.4% annually over the decade between 2001 and 2010. In the decade before 2000, the countryôs average growth rate was only 1.35%. Since the rebasing of Nigeriaôs economy in 2011, the average growth rate has been fluctuating between 4.89% and 6.31% (African Development

Bank [AfDB], Organization for Economic Co-operation and Development [OECD], & United Nations Development Program [UNDP], 2015; World Bank, 2015).

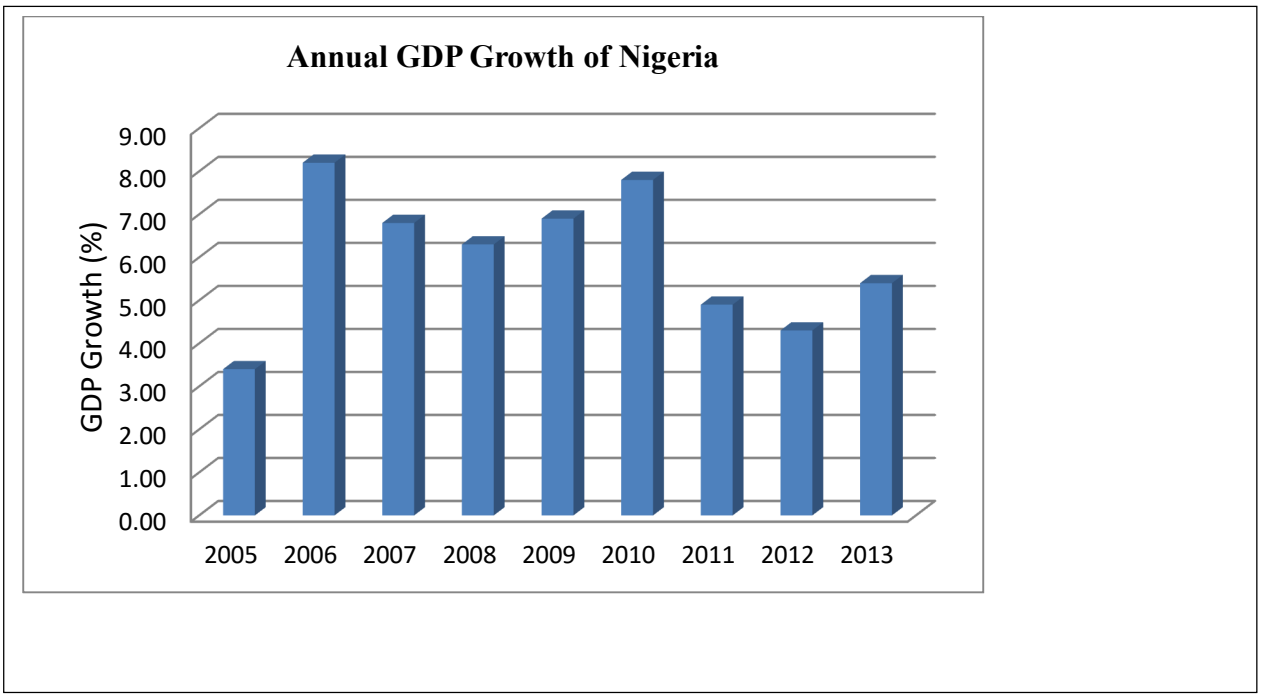

Figure 2. Annual GDP growth of Nigeria. Adapted from ñWorld DataBankò by World Bank, 2016 (http://databank.worldbank.org/data/home.aspx). Idornigie, P. O. (n.d.). Public-private partnerships: The issues, prospects and challenges

The oil sector contributes over 80% of government revenue, although it is the nonoil sectors that have been driving the countryôs growth in recent times. The nonoil sectors responsible for the growth include agriculture, manufacturing, telecommunications, construction, and mining, among others (AfDB et al., 2015). Figure 2 depicts the GDP performance of Nigeria in comparison with the real GDP compound annual growth for other emerging and subsaharan African countries (World Bank, 2015).

However, the remarkable economic growth has neither reduced poverty nor created necessary jobs. The African Economic Outlook (2015) ranked Nigeria as low (less than 0.5) in the Human Development Index (HDI). HDI scores are on a scale of 0 (lowest) to 10 (highest). The same report also ranked Nigeria at 0.6 on the Multidimensional Poverty Index (MPI). About 100 million of Nigeria's estimated population of 177 million lives below the poverty line of less than 1 U.S. dollar (USD) per day. Although Nigeria created over 1.6 million jobs in 2013, unemployment was 38% in the 15-24 age group and 22% in the 25-44 group. The estimate by the National Bureau of Statistics is that over 4 million people enter the job market each year. The potential for economic development is stymied by huge infrastructure deficit, particularly in transport and power (Schwab & World Economic Forum [WEF], 2014). These low-ranking scores amidst high economic growth performance are indicative of the paradoxes that characterize the Nigerian economy.

In the next section, I present an overview of the privatization exercises leading to the concession of the 24 port terminals that were the subject of this inquiry.

The Privatization of Nigerian Seaports

Imperative for privatization. In the early 1970s, Nigerian seaports had a total cargo handling capacity of 6.5 million metric tons per annum. These ports were largely concentrated in Lagos, the national capital at that time. Nigeria had just emerged from a debilitating civil war, and the demands for reconstruction overstretched the existing capacity of the ports at the time (Gidado, 2015). As a result, there were long queues of ships waiting to berth and huge stacks of containers and general cargos awaiting evacuation. Infrastructure challenges such as those

related to port access roads and bridges created vehicular gridlock at the entrances of ports, which further exacerbated the congestion. According to Nwanosike (2014), ships had to wait for between 180 and 250 days to berth. The consequent cost imposed on importers, exporters, and public agencies that relied on the ports for revenue such as taxes, royalties, levies, charges, and other revenues strained the fledging economy. The country took such emergency measures as the construction of Tin Can Island port, but these moves did little to resolve the congestion. With this development, it became clear to the Federal Government of Nigeria (FGN) that the Nigerian Ports Authority (NPA), landlord and operator of all seaports in Nigeria, lacked the resources and managerial ability to operate modern seaports. Besides, governments globally were disengaging from the operation of seaports as a means of enhancing global competitiveness (Nwanosike, 2014). With these developments, it became clear to the NPA and policymakers in the maritime sector that serious port reforms were imperative.

The ensuing ports reform program, which ended in 2006, resulted in the expansion of the existing cargo handling capacity at the ports to over 25 million tons per annum and the transfer of the control, management, and operations of 24 of the ports to the private sector. The government retained ownership as well as control of policymaking, regulation, and supervision of the ports. The government also accompanied the privatization program with trade liberalization and deregulation of the economy, in addition to other policy measures designed to create an enabling environment for robust private sector participation in the economy (Jaja, 2009). In embarking on the privatization exercise, the government had the objective of reducing budgetary allocation to the ports for daily operations, increasing revenue generation, increasing

the volume of cargo handled at the ports, and improving cost efficiency. Other objectives included the complete restructuring of the maritime sector of the economy and deepening the countryôs capital market (Filipovic, 2005; Oghojafor et al., 2012).

Preprivatization Status of Nigerian Seaports

Before the privatization of the Nigerian ports in 2006, the productivity and other performance indices at the ports were at their lowest ebbs (Ndikom, 2013). Table 1 shows some key performance indicators at the ports between 1995 and 2005. Oghojafor et al. (2012) observed that before the privatization of ports in Nigeria, the turnaround time for ships was in weeks, sometimes months, as against the global performance of 0.71 days for Taiwan and 1.16 days for Singapore (Ducruet & Merk, 2013). Ship turnaround time is a measure of the time it takes to load and offload a ship. The NPA lacked modern cargo-handling plants and equipment. The few that were available were unserviceable. Equipment rental by the NPA from private sources at exorbitant rates was commonplace, making the Nigerian seaports the costliest in the world.

The high level of unchecked corruption at the ports among law enforcement officials, regulatory agencies, and service providers further exacerbated the problems of the ports. Cases of pilfering, theft, and missing goods were rampant; and poor management style led to avoidable congestion. Additionally, the port premises and quay aprons had fallen into disuse, and the connecting and internal road network had many failed sections, slowing down the evacuation of goods. Apart from the resulting loss of revenue to the government, the ports suffered a loss of patronage from national and international customers alike. According to Table 1, the utilization

of port facilities in Nigeria was as low as 50% at the best of times (Ndikom, 2013; Oghojafor, 2012).

Table 1

Key Port Productivity and Performance Indicators (1995-2005)

Year	Cargo throughput (tons)	Ship waiting time (days)	Ship turnaround time (weeks)	Berth occupancy (%)	Berthing days (days)
1995	13273053	0.47	6.17	27.76	5.70
1996	15475301	0.46	6.34	36.68	5.88
1997	16609805	0.47	6.71	36.72	6.24
1998	19325718	0.39	7.31	41.39	6.92
1999	22232936	0.36	6.31	47.09	5.95
2000	28932880	0.34	7.01	44.76	6.67
2001	35940692	1.27	7.91	51.78	6.64
2002	36987241	3.99	11.34	56.58	7.35
2003	39765945	2.17	7.89	52.75	5.72
2004	40816947	1.44	6.44	50.93	5.00
2005	44952078	2.60	7.40	49.70	4.80

Note. From Mohammed A. (2008). Enhancing port efficiency through concession of operations. In *Being a paper presented by Abdul Salam Mohammed (Managing Director, NPA) at the African Ports and Harbour Congress, Johannesburg, South Africa*. Retrieved from http://www.nigerianports.org.

The Port Privatization Exercise

The Bureau of Public Enterprises (BPE) in Nigeria was responsible for the privatization exercise leading to the concession of the 24 port terminals. The BPE also received the proceeds of the privatization exercise on behalf of the government. Through the privatization exercise, the government gave out the ports on concession to private operators who were expected to finance, upgrade, expand, modernize, and operate the facility for the provision of ports' services for periods ranging from 10 to 35 years. At the end of the concession period, control and operation

of the assets would return to the government. In return, the private port operators would generate revenues from tariffs on users and other user charges over the life of the concession. The ownership of the ports and the regulation of service standards reside, respectively, with the NPA and the Nigerian Shippers Council (NSC). The NSC will be the economic regulation authority until the establishment of statutory regulation through the enactment of the Ports and Harbor Bill developed by the government in 2006.

The BPE implemented the privatization of the port industry in Nigeria in two stages. The first stage involved the deregulation of the maritime sector, which the government had previously operated as a monopoly. The deregulation comprised a vertical unbundling of the industry and the separation of the function of policymaking from those of regulation and operations. At the second stage, the government opened up participation in the operations of the ports to both nationals and foreign private investors through an international bidding process.

Subsequently, the government executed concession contracts between the NPA (landlord) and qualified private firms to provide port services. Together with the transfer of some property rights by the government to the private sector by way of concessions, the concession contracts established the expected standards for performance. The contract also provided for significant investments in facility upgrades, technology, and management (Estache, de la Fé, & Trujillo, 2004; Oghojafor, Alamene, & Kuye; Okeudo, 2013; 2012). The concession contracts allowed private operators the use of the terminals and facilities for upward of 10 years on a build, operate, and transfer basis (Eniola et al., 2014). Table 2 shows the terminals, their locations, depth of berth, and associated quay length.

Table 2

Location and Characteristics of the Nigerian Ports

S/No	Port	Location	Depth of berth	Quay length (meters)
1	Apapa Port Terminal A	Lagos	8.5-9.0	455
2	Apapa Port Terminal B	Lagos	8.5-9.0	280
3	Apapa Port Terminal C	Lagos	8.5-9.0	760
4	Apapa Port Terminal D	Lagos	8.5-9.0	740
5	Apapa Port Terminal E	Lagos	8.5-9.0	510
6	Apapa Port Container Terminal	Lagos	8.5-9.0	1000
7	Tin Can Island Port Terminal A	Lagos	8.5-9.0	484
8	Tin Can Island Port Terminal B	Lagos	8.5-9.0	765
9	Tin Can Island Port Terminal C	Lagos	8.5-9.0	789
10	Tin Can Island Roro Port	Lagos	8.5-9.0	437
11	Lily Pond Container Terminal*	Lagos		
12	Port Harcourt Port Terminal A	Port Harcourt	9.0-9.5	660
13	Port Harcourt Port Terminal B	Port Harcourt	9.0-9.5	599
14	Warri Old Terminal A	Warri	4.5-6.5	150
15	Warri Old Terminal B	Warri	4.5-6.5	320
16	Warri New Terminal A	Warri	4.5-6.5	1165
17	Warri New Terminal B	Warri	4.5-6.5	465
18	Warri Canal Berth	Warri		
19	Calabar New Port Terminal A	Calabar	11.0	1137
20	Calabar New Port Terminal B	Calabar	11.0	1137
21	Calabar Old Port	Calabar	11.0	1137
22	Onne FLT A	Onne	5.7	
23	Onne FLT B	Onne	5.7	
24	Onne FOT A	Onne	5.7	

Note. Data from Oghojafor, B. E., Kuye, O. L., & Alaneme, G. C. (2012). Concession as a strategic tool for ports efficiency: An assessment of the Nigerian ports. *American Journal of Business and Management, 1*(4), 214ï 222; Omoke, V., Diugwu, I. A., Nwaogbe, O. R., Ibe, C. C., & Ekpe, D. A. (2015). Infrastructure financing and management: The impact of concession on the operations and performance of Nigerian seaports. *Journal of Behavioural Economics, Finance, Entrepreneurship, Accounting and Transport*, *3*(2), 65ï 70. https://doi.org/doi:10.12691/jbe-3-2-; and Chigbue & BPE (2007). The Bureau of Public Enterprises: 1999-2007. *Presented at the National Council on Privatization, Abuja, Nigeria.*
* 120,600 m^2 stacking area.

Figure 3 shows the locations of the port terminals on concession all over the Nigerian coastal region, in Lagos, Warri, Port Harcourt, Onne, and Calabar.

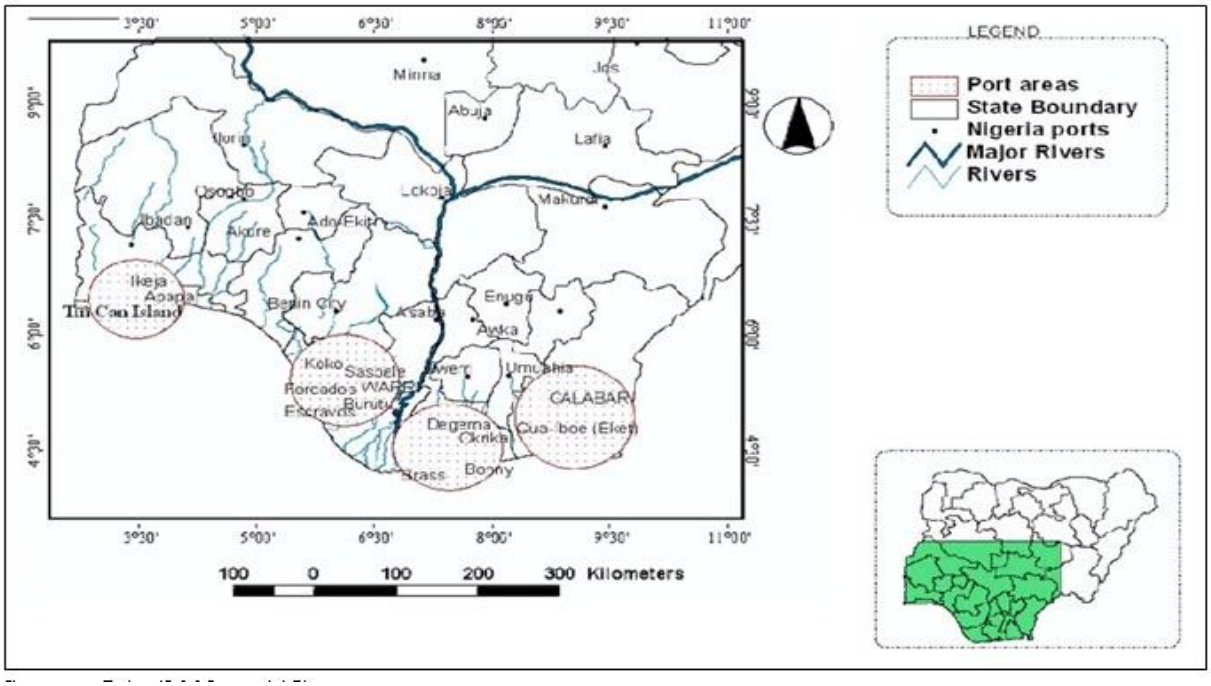

Figure 3. Location of Nigerian seaports. From ñPort Development in Nigeria: Trends and Patterns,ò by C. Jaja, 2009, *Journal of Transportation Security*, *2*(4), p. 113. Copyright 2009 by C. Jaja

Need for the Study

A review of the literature indicates that scholars and relevant stakeholders know very little about the relevance of privatization in developing countries (Al-Obaidan, 2002). In truth, there have been very limited studies on the impact of privatization on the economies of developing countries. It has been over 30 years since Nigeria started its privatization program. During the intervening period, the government undertook the privatization of over 167 SOEs, including the 24 ports. The FGN is currently contemplating the privatization of its oil behemoth, the Nigerian National Petroleum Corporation (NNPC). The NNPC currently contributes over

90% of the countryôs oil export and foreign exchange (Thurber, Emelife, & Heller, 2010). Nevertheless, there have been scant studies on the subject.

Regarding the privatization of the ports, for instance, the government had some specific objectives for embarking on the exercise. These included increasing cargo throughput at the ports and consequently increasing revenue generation for government by way of dividends, taxes, duties, licenses, and the like from ports operations. Another key objective is to improve the overall operational efficiency and competitiveness of the ports. This objective translates into reducing the ship waiting time and ship turnaround time, increasing berth occupancy, and reducing the cargo handling charges. There is also the objective of reducing the dependence of the ports on the treasury for day-to-day operations, in addition to fundamentally restructuring the maritime sector (Filipovic, 2005). Clearly, policymakers in Nigeria and critical stakeholders will be interested in knowing the extent to which the privatization program has achieved these objectives. Even where the privatization exercise has not resulted in the expected outcomes, policymakers and stakeholders will also want to know the underlying reasons. In particular, it will be necessary to construct or deconstruct the theoretical understanding of the privatization phenomenon, using reality borne out of everyday practical experience. The intention is to either provide support for or induce a shift in legislative policy as it relates to privatization (Nellis, 2003).

Positive Social Change Implications of the Study

The ultimate objective of policy is to effect some social change. A review of existing literature revealed five strands of studies relating to privatization. According to Bernerth (2004),

it is possible to map social change activities into eight activity strands. These elements of social change are scholarship, systemic thinking, reflection, practice, collaboration, advocacy, civic engagement, and humane ethics. In this study, I sought to combine two threads of privatization studies, namely economic impact and efficiency studies. The focus of this study was on the ñpracticeò characteristic rather than the ethics feature. The intention of the ñpracticeò characteristic is to construct or deconstruct the theoretical understanding of a phenomenon, using reality borne out of everyday practical experience. That way, the study either provides support for privatization and other structural adjustment programs or induces a shift in legislative policy as it relates to these programs (Bernerth, 2004). The intention is to either provide support for or induce a shift in the legislative policy as it relates to privatization. The government intended to create a number of social changes that would have positive effects on the society by embarking on privatization. These included, but were not limited to, increasing overall short and long-term economic growth; increasing the efficiency of economic units, and by so doing, increasing income, employment, output, and profits; and expanding the capital market. Studying the efficiency and productivity effects of privatized firms provided an indication of the overall effect of privatization on the sector and the economy.

Gap in Knowledge That Study Addressed

Since the privatization of the Nigerian ports 10 years ago, there have been limited empirical studies on this policy initiative (Obed & Emeghara, 2012; Oghojafor, Kuye, & Alaneme, 2012; Okeudo, 2013). The available studies emphasized the impact of privatization on single-port performance indicators including cargo throughput, berth occupancy, berth capacity,

ship waiting time, ship turnaround time, and port handling charges. Regrettably, the single-port focus, while not holistic enough to evaluate a multiport system, ignored the efficiency improvements that serve as the crux of the neoliberal growth argument in support of privatization (Quansah, 2014; Talley, 2006). More importantly, the studies failed to establish a nexus between efficiency improvements at the ports following the privatization and economic growth, income distribution, employment, or cost of living. Additionally, even where the focus was on the impact on port performance indicators, the studies failed to control for general historical events that have the potential to provide alternative explanations for any observed changes at the ports sequel to the privatization. Thus, it is difficult to establish that postprivatization changes at the ports are indeed attributable to the privatization exercise directly or associated with the influence of the covariates. The objective of the study is to fill these gaps in the literature.

How the Study Filled the Gaps

The purpose of this quantitative study was to examine the empirical relationship between privatization and economic growth, using longitudinal data on efficiency and productivity from the privatization of Nigerian ports. The study proceeded on the premise that the privatization of the seaports did incentivize the concessionaires into making additional investments toward improving efficiency and productivity. The postprivatization investments were in the areas of facility upgrade, innovation, technology, and management (Cullinane, Ji & Wang, 2005). In the first instance, the study ascertained the nature and extent of the relationship between the logistics improvement at the ports arising from the privatization exercise and the productive efficiency of the ports following the privatization exercise. This segment of the study used the frontier

productivity models to determine the relative productive efficiency of the ports before and after the privatization (Kessy, 2008).

The second strand of the study used the Cobb-Douglas type economic growth model advanced by Odedokun (1996) for determining sectoral impact on economic growth to establish a relationship between productivity efficiency improvements at the ports following privatization and economic growth in Nigeria. The logic behind this approach is that developments in the port sector could affect economic growth directly, either through increases in cargo volumes, decreases in inefficiency, or both (Kessy, 2008). The production function reflected this logic. I elaborate on this approach in Chapter 3 of the study.

Problem Statement

Economic theory posits that privatization promises superior economic performance for countries through higher economic efficiency that the policy engenders (Cook & Uchida, 2003; Filipovic, 2005; Plane, 1997). Apparently informed by this notion, and at the insistence of the World Bank and the IMF, the Nigerian government adopted structural adjustment programs early in the 1980s, seeking better efficiency and enhanced economic growth (Boubakri, Smaoui, & Zammiti, 2009). Through the program, the government privatized over 167 SOEs, including 24 seaports. The government also undertook substantial sector deregulation and trade liberalization.

There is empirical evidence that port privatization induces productivity and efficiency improvements through logisticsô facility upgrade, innovation, technology, and management (Cullinane et al., 2005). However, some studies have shown that there is reciprocal causation between the GDP, together with other aggregate economic indicators, and productivity

improvements at the ports (Anyingang & Udoka, 2012; Seabrooke, Hui, Lam, & Wong, 2003). The GDP is also dependent on the level of investment and productivity efficiency changes brought about by the privatization of the ports. This web of interrelationships and reciprocal causation between the variables at play in ports privatization makes it difficult to distinguish the effects that are attributable to the privatization exercise directly from those associated with other intervening variables without controlling for the influence of the intervening variables. Plane (1997) introduced a further complication to the complex web of relationships associated with the port privatization by insisting that the privatization policy had little or no impact on economies not implementing deregulation and trade liberalization policies simultaneously. The implication of the findings Plane reported was that institutional factors influence relationships associated with port privatization significantly.

In addition to the above issues, the few studies available on the privatization of ports in Nigeria focused on the impact of privatization on productivity and other performance indicators, including cargo throughput, berth occupancy, berth capacity, ship waiting time, ship turnaround time, and port handling charges. These are good performance measures for single ports but inadequate for a multiport system such as Nigeriaôs. Additionally, this emphasis ignored the efficiency improvements that serve as the crux of the neoliberal growth argument for privatization in the first instance. More importantly, the studies failed to establish causality between efficiency improvements at the ports following the privatization and economic growth. The objective of this study, therefore, was to fill this gap in the literature by controlling for such

internal validity issues, which have the potential to invalidate the inference of causality (Campbell & Stanley, 1963).

Currency, Relevance, and Significance of Research Problem

In their 2009 study, Abdou and Moshiri (2009) observed that despite the substantial literature on privatization over the past 30 years, the focus of empirics has been largely on the effect of the policy on output, profitability, investment and efficiency gains at the level of the firm. Megginson and Netter (2001) made a similar observation in their review of the implementation and aftermath of privatization in 70 different studies. Like Abdou and Moshiri (2009), Megginson and Netter observed the preponderance of studies with a focus on efficiency, profitability, capital investment, and leverage within privatized entities, with scant attention to growth, employment, and the distributional effects of privatization.

Al-Obaidan (2002) observed that despite the asymmetry in research and literature on the effects of privatization between market-based economic systems and those of developing markets, very little empirical work had occurred in the latter. The handful of privatization studies that have been conducted on growth includes Abdou and Moshiri (2009), Al-Obaidan (2002), Cook and Uchida (2003), Filipovic (2005), and Plane (1997). Except for Cook and Uchida who observed a robust negative correlation between privatization and growth in developing countries, scholars found various degrees of causality between privatization and growth. Therefore, there is an apparent dearth of literature on the merits or otherwise of effects of privatization in poorly developed market economies such as Nigeria, in addition to a scant focus on the effects of privatization on economic growth, employment, and income distribution.

This observation extended to studies on the privatization of the Nigerian ports 10 years ago. Since the exercise, there have been very limited empirical studies on the subject (Obed & Emeghara, 2012; Oghojafor et al., 2012; Okeudo, 2013). Rather than focusing on the much-touted ñefficiency improvementsò that neoliberal growth theorists noted in support of privatization, the limited studies focused on the impact of privatization on port performance indicators such as cargo throughput, berth occupancy, ship turnaround time, and the like. Additionally, the studies failed to control for alternative explanations of perceived postprivatization changes and did not establish a causal relationship between postprivatization efficiency improvements and economic growth.

Regarding port privatization, in general, there are empirical studies that support the proposition that port privatization and accompanying logistics improvement induce productivity efficiency improvements (Caldeirinha, Felício, & Coelho, 2009; Cullinane & Wang, 2006). These studies used the multiport system approach involving either stochastic frontier analysis (SFA), or data envelopment analysis (DEA) techniques in their construction of the productivity efficiency indices. However, none were designed to establish a nexus between postprivatization efficiency improvements and economic growth. There is a growing body of recent research on the effects of improvements in port logistics on economic growth. Huang and Peng (2014) found that the development of the logistics industry in Zhejiang Province is one of the most important factors influencing economic development in that region of China. Liu and Li (2007) also observed reciprocal causation between developments in the logistics industry and economic growth. This view also received support from such studies as and Na (2014), Liu and Yu (2010),

and Shao and Zheng (2011). Although these studies provided empirical evidence for a close association between port development and a countryôs economic growth, they had little else in common in design and methods of analysis. While Liu and Li used the Granger causality test in their study, Huang and Peng used a combination of the Grey correlation to calculate the relevance of logistics development and the economy and DEA to evaluate the influence of the logistics industry on the economy. Liu and Yu combined the DEA and Tobit model in their analysis.

Tian and Zhou (2008) used a slightly different approach to their study of the impact of the financial sector on Chinese regional economic growth. In their study, Tian and Zhou first used parametric SFA to estimate the technical efficiency of the banks. Subsequently, they incorporated this technical efficiency score into a growth regression equation to determine the impact of the banking sector on economic growth (Tian & Zhou, 2008). In the same vein, Kessy (2008) used the Charnes, Cooper, & Rhodes (1978) variant of the DEA model (known as CCR) to estimate the bank efficiency coefficient, and subsequently integrated the score into the Cobb-Douglas type growth regression equation.

Purpose of the Study

The purpose of this quantitative study was to examine the empirical relationship between privatization and economic growth, using longitudinal data on efficiency and productivity from the privatization of Nigerian ports. This study tested the proposition that the transfer of property rights in the ports by the government to the private sector during the privatization provided the incentive for the latter to make the additional investment to improve productivity efficiency.

Second, the study determined the effect, size, and direction of the changes in the key variables that accompanied the postprivatization investments. These efficiency and productivity measures included cargo throughput, berth occupancy, berth capacity, ship waiting time, ship turnaround time, and port handling charges (Oghojafor et al., 2012; Okeudo, 2013). Third, the study established the extent to which the ports privatization had impacted overall economic growth. The last objective was to establish the theoretical conditions that distinguish more effective privatization programs from less effective ones, using the ports privatization as a point of reference.

The study approached the research problem through a series of iterative steps. The first step involved the ascertainment of the effect, size, and direction of the relationship between the logistics improvement at the ports brought about by the port privatization and the productive efficiency of the ports after the privatization exercise. This step of the study will use the DEA to determine the efficiency of the ports. According to Harrison (2010), the DEA allows researchers to evaluate ñthe technical efficiencies of a collection of decision-making units (DMUs)" (p. 3). The DEA approach uses the linear programming technique to develop a nonparametric frontier over the data. The technique first identifies the set of best practice observations for which no other firm can produce as much or more of every output given the inputs. Next, the approach calculates the efficiency measures about this surface (Kessy, 2008). According to Charnes, Cooper and Rhodes (1978), as cited in Harrison (2010), a DMU, the port terminal in this instance, is 100% efficient when it is not possible to increase or decrease output by increasing or decreasing one or more inputs.

In this study, the objective function for the DEA sought to maximize output. According to Cullinane et al. (2006), where the productive objective of a DMU is to maximize cargo throughput, then the inputs are likely to be state-of-the-art and expensive equipment that will improve its productivity. However, where the objective is to maximize profit, then the port will be more willing to deploy cheaper equipment. In the former case, the output of the port will be cargo throughput, whereas, in the latter case, the objective will be profits (Cullinane et al., 2005). The possible output variables into the linear programming model are total tonnage of goods handled at the ports or cargo throughput. The inputs into the DEA include total quay length, the terminal area, the number of gantry cranes, the number of yard gantry cranes, and the number of straddle carriers as the most suitable inputs (Cullinane et al., 2005; Cullinane, Gray, & Song, 2002); Cullinane et al., 2006).

This next phase in the study deployed the Cobb-Douglas type economic growth model to establish a nexus between productive efficiency improvements at the ports following privatization and economic growth in Nigeria. There were a total of four regressions to establish the relationship between the dependent variables, which in this instance were real GDP, GDP growth, GDP per capita, and GDP per capita growth, and the independent variables. The independent variables were labor force, capital stock, and the measure of the level of maritime sector development. The covariates were proxies for institutional factors, trade openness, an index of corruption or the ratio of government consumption to GDP, and the growth rate of real GDP per capita. Other covariates were credit to the private sector as a percentage of GDP and the real interest rate and the inflation rate. The proxy for trade liberalization or trade openness is the

ratio of exports and imports to GDP (Barro, 1989; Calderón & Servén, 2010). This study made use of the ñdistance to frontier scoreò developed by the World Bank for ranking countries in the ease-of-doing-business index as a proxy for the effects of deregulation. The ease-of-doing-business index measures the efficiency of regulations regarding procedures, time, and cost as they affect small and medium-sized enterprises operating in an economy.

Research Question(s) and Hypotheses

The central research question in this study was the following: What is the effect of port concession on economic growth? The subquestions that derived from the main question were as follows:

1. What is the effect of the postprivatization investment on productive efficiency of the ports after privatization?
2. To what extent does the postprivatization productive efficiency of the ports predict changes in GDP, GDP growth, GDP per capita, and GDP per capita growth?

The study used the nonparametric DEA to construct the productive efficiency index for the port sector before and after the privatization exercise. The latter scores served as input into a multivariate growth regression to determine the relationship between the port sector and long-term economic growth.

Null and alternative (research) hypotheses.

Hypothesis 1. The level of investments at the Nigerian ports that accompanied their privatization can accurately predict the portsô efficiency index.

H_o: $\beta_1 < 1$ (the total factor productivity $\beta_1 < 1$)

H_1: $\beta_1 > 1$ (the total factor productivity $\beta_1 > 1$)

Hypothesis 2. A causal relationship exists between the linear combination of the portsô total efficiency index, institutional factors, trade openness, the index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput and the level of the GDP in Nigeria.

H_o: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $\beta_1 \neq 0$ (at least one coefficient $\beta_1 \neq 0$)

Hypothesis 3. A linear combination of total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could accurately predict the GDP growth in Nigeria.

H_o: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $\beta_1 \neq 0$ (at least one coefficient $\beta_1 \neq 0$)

***Hypothesis 4*.** The linear combination of the total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate,

privatization proceeds, and cargo throughput could explain the variations in the level of the GDP per capita in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1$ Í 0 (at least one coefficient $б_1$ Í 0)

***Hypothesis 5*.** The linear combination of the total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could accurately predict the GDP per capita growth in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1$ Í 0 (at least one coefficient $б_1$ Í 0)

Where $б_1$ = total efficiency index; $б_2$ = institutional factors; $б_3$ = trade openness; $б_4$ = index of corruption; $б_5$ = credit to the private sector; $б_6$ = real interest rate; $б_7$ = inflation rate; $б_8$ = privatization proceeds; and $б_9$ = cargo throughput.

Theoretical Framework for the Study

Theoretical Foundation and Major Postulations

Privatization is essentially a strategy of neoliberal economic growth theory. According to the neoliberal school, individually rational and decentralized decisions dictated by price signals from the market will ultimately lead to an efficient allocation of resources and distribution of income (Woo-Cumings, 1999). There are a number of concepts, frameworks, and theories in the

literature that underlie the concept of privatization. The often-cited theory, based on the existing literature, is property rights theory (Filipovic, 2005). Property rights theory predicts that the transfer of ownership, management, and control of SOEs from the state to the private sector by way of privatization creates incentives for the latter to make the level of investment necessary to induce higher performance (De Soto, 1993; Filipovic, 2005). According to De Soto (1993), it will be difficult for investors to justify making additional investment in a SOE in the absence of clearly defined and well-protected property rights (De Soto, 1993). Furthermore, it is the absence of clearly defined property rights that impedes economic development, particularly in developing countries. Formal property rights assure investors of the security of their investment under privatization. In his view, property appears to be the ñmissing ingredientò that impedes economic development (De Soto, 1994; Heitger, 2003).

Other theories such as the Coase theorem, public choice theory, and principal-agent theory provide additional justification for the concept of privatization (Cavaliere & Scabrosetti, 2008; De Soto, 1993; Filipovic, 2005; Wright, 1993;). The Coase theorem proposes that private sector operators, guided by enlightened self-interest, can arrive at Pareto-optimal solution through negotiated settlements and do not require the interference or intervention of the state (Filipovic, 2005). Public choice theory postulates that the policymakers in any society, being rational self-maximizers, will always act in their parochial interests rather than in the public interest. Thus, allocative decisions made by policymakers will always be suboptimal and skewed toward the personal preference of the state actors (Wright, 1993). Principal-agent theory states that the observed divergence between the efficiency effect of privatization and the outcomes

disclosed by empirical literature arises from the twin agency challenges of ñmanagerial perquisite consumptionò and ñentrenchmentò (Boris and Whited, 2009, p. 33). While managerial perquisite consumption erodes profits, entrenchment diminishes the effectiveness of controls (Cavaliere & Scabrosetti, 2008; Dharwadkar, George, & Brandes, 2000; Sappington & Stiglitz, 1987).

This study tested the postulation that the transfer of property rights from the public to the private sector through concession incentivizes the latter to make such levels of investment as will induce a positive change in efficiency, productivity, and economic growth. The study, therefore, involved judgments of the probability that observed changes in port efficiency, productivity, and economic growth following the concession occurred either as a result of the concession or due to chance.

Property Rights Theory and Research Questions

Economic theory predicts that the property rights conferred by way of privatization incentivize the private sector to make a greater investment in facility improvements, technology, management, and innovation, with the intention of generating efficiency gains, better services, increased productivity, and enhanced profitability (Tongzon & Heng, 2005). The purpose of this study was to examine this relationship using longitudinal data on efficiency and productivity from the privatization of Nigerian ports. The government of Nigeria carried out the privatization program for purposes of improving the operational effectiveness and productive efficiency of the ports, among other objectives. Property rights theory offers the proposition that the transfer of property rights from the public to private investors creates the incentive for the latter to make the

additional investments necessary to induce increased efficiency, increased productivity, and, ultimately, increased shareholder wealth (De Soto, 1993). Empirical evidence exists to support this proposition. In his assessment of the effectiveness of privatization as a policy option for promoting economic growth, Filipovic (2005) found that the property rights conveyed through privatization create a strong incentive to invest in productivity and efficiency improvements. The study further tested this proposition by examining the extent to which investments at the ports sequel to the privatization impacted the productivity efficiency of the ports, and how such productivity improvements affected the long-term economic growth of the country.

With these objectives in mind, I first sought to determine the effect of postprivatization investment and logistics improvements on the productive efficiency of the ports. This phase of the study constructed the productive efficiency index that served as input into a growth logistic regression. The growth models established the extent to which the postprivatization productive efficiency of the ports had produced changes in the real GDP, GDP growth, GDP per capita, and GDP per capita growth. Answers to the research questions validated the theoretical proposition regarding the role of property rights in privatization.

Nature of the Study

This study examined the empirical relationship between privatization and economic growth, using efficiency and productivity data from the privatization of Nigerian ports. There were two stages to this study. At the first stage, the study measured the impact of postprivatization investments on the productive efficiency of the ports. The study used the DEA to construct the productivity of ports after the privatization exercise. The second stage of the

study determined the nature and extent of the relationship between the logistics improvement at the ports consequent upon the privatization and economic growth in Nigeria.

There have been studies of the effects of the improvement of port logistics on economic growth in the literature. Huang and Peng (2014) deployed Grey correlation analysis and the DEA approach. Tian and Zhou (2008) used a slightly different approach in their study of the impact of the financial sector on Chinese regional economic growth. In their approach, Tian and Zhou first used the parametric SPF to estimate the technical efficiency of the banks. After that, the researchers incorporated this technical efficiency score into a growth regression equation (Mankiw et al., 1992) to determine the impact of the banking sector on economic growth (Tian & Zhou, 2008). These studies departed from previous studies using DEA and SCF to construct the total productive efficiency index of ports. They subsequently inserted the productivity index of a growth function before analysis (Cullinane et al., 2005; Hung, Lu, & Wang, 2010; Tongzon & Heng, 2005; Wu & Goh, 2010). In the same vein, Kessy (2008) again used the CCR to estimate the bank efficiency coefficient and subsequently integrated the score into the Cobb-Douglas type growth regression equation.

This study followed the tradition established by Kessy (2008) in his study of the effect of efficiency in the financial sector on economic growth. Kessy used the Charnes, Cooper, and Rhodes (1978) variant of the DEA model or CCR to estimate the bank efficiency coefficient and subsequently integrated the score into the Cobb-Douglas type growth regression equation. Other such studies as Tongzon and Heng (2005), Cullinane, Ji and Wang (2005), Hung, Lu, and Wang (2010), and Wu and Goh (2010) equally used the DEA to estimate the efficiency coefficient of

ports. This study, therefore, used the DEA to construct the productive efficiency index for the port sector after the privatization exercise. The productive efficiency index scores served as input into the Cobb-Douglas type growth equation to determine the relationship between the port sector and long-term economic growth.

Research Design

The design for this study was the correlational design. The correlational method of research allows the researcher to examine ñthe effects of a naturalistically-occurring treatment after that treatment has occurred rather than creating the treatment itselfò and ñrelate this after-the-fact treatment to an outcome or dependent measureò (Tuckman and Harper, 2012, pp. 123-124). According to Lord (1973), the design ñseeks to establish causal relationships between events and circumstancesò (p. 3). The design establishes a causal relationship by comparing the circumstances associated with observed effects and by noting the factors present in the instances where a given effect occurs and where it does not occur.

The objective of the correlational design is to discover or establish causal or functional relationships among variables rather than causal relations (Lord, 1973). The logic behind the design is that the ñcauses of a given observed effect may be ascertained by noting elements that are invariably present when the result is present and which are invariably absent when the result is absentò (p. 6).

Justification for Research Design

Unlike the pure experimental design, which involves the comparison and recording of differences and contrasts, the correlational design involves studying one single group after an

event has occurred. The design does not control the variable factor as with the experimental design. Rather, the researcher observes the phenomenon under study under normal field conditions and discovers the causes of observed phenomena. The pure experiment establishes a causal relationship between variables by using a random assignment of participants between study-groups used for comparison. With the correlational design, it is not possible to randomly assign participants to control groups, nor is it possible to manipulate the variables because the events of interest have already taken place or occurred naturally. As a result of these and other limitations, it may not be possible to establish the order of influence between variables, even where there is a very strong correlation between the variables. Furthermore, because the design methods lack random assignment, active manipulation, and rigorous control over extraneous factors, the possibility for a particular outcome to arise from different causes or a third variable on different occasions is quite high (Lord, 1973).

However, there are some correlational analyses in the literature that provide the techniques for addressing the problems of directionality and third variables, although they all have their limitations. Regarding the problems of establishing the order of influence between variables or the direction of control, the available statistical tools include the time-lagged correlational design or cross-lagged panel correlation (Hamaker, Kuiper, & Grasman, 2015). The literature recommends the use of partial correlation analysis for dealing with the third variable problem. The other statistical technique available for resolving the third variable problem is ñmatching,ò where the researcher matches data from participants with the same characteristics of the third variable (Frankfort-Nachmias & Nachmias, 2008).

Key Study Variables

Apart from ascertaining the effects of postprivatization investments on port productivity, the study investigated the extent to which the postprivatization productive efficiency of the ports predicts changes in the GDP, GDP growth, GDP per capita, and GDP per capita growth? Thus, there were four dependent variables, namely the GDP, GDP growth, GDP per capita, and GDP per capita growth, for the four regressions necessary to provide an answer to the research question. The independent variables were the labor force, capital stock, and a measure of the level of ports sector development. The covariates were proxies for institutional factors, trade openness, an index of corruption or the ratio of government consumption to GDP, and the growth rate of real GDP per capita. Other covariates were credit to the private sector as a percentage of GDP and the real interest rate and the inflation rate. The proxy for trade liberalization or trade openness is the ratio of exports and imports to GDP (Barro, 2000; Calderón & Servén, 2010). This study used the distance to frontier score developed by the World Bank for ranking countries in the ease-of-doing-business index as a proxy for the effects of deregulation. The ease-of-doing-business index measures the efficiency of regulation regarding procedures, time, and cost as they affect small and medium-sized enterprises operating in the two largest business cities of an economy. Both the independent variables and covariate remained the same in each of the four regressions carried out.

Summary of Methodology (IRB approval number 05-03-16-0337924)

The population of the study was the group of 24 privatized ports in Nigeria. The guiding principle in selecting a population for a study is to establish the homogeneity of the population.

According to Patton (2002), the members of the population must have some distinguishing feature in common. The first distinguishing feature of the study population was that the 24 privatized ports under study were all operating within the geographical confines of Nigeria. Thus, the ports were subject to identical institutional, legal, and regulatory frameworks applicable in Nigeria. The ports also operated within the same investment environment (NPA, 2014). Third, all of the ports had been in operation for a minimum of 9 years since the concession.

Data Collection. The data required for the study were drawn from five main secondary sources. The first consisted of data published routinely for administrative purposes by the NPA, the landlords of the Nigerian ports. These comprised quarterly performance reports on ports operations from all ports, detailing efficiency indicators and investment performance by concessionaires. The second source of data consisted of concession agreements executed between the government and the concessionaires. These agreements provided details on the rights and obligations of the parties under the concession. They also included the agreed-upon postacquisition investment plans of each concessionaire and the expected key performance indicators. The Infrastructure Concession Regulatory Commission (ICRC), responsible for the custodianship of these concession agreements, provided details of the obligations of the parties to the concessions. It also ensures compliance with the terms and conditions of the contracts. In addition, the ICRC prepares routine monitoring and compliance reports for periods covered by the concessions. The third source of data was published information available through the websites of the CBN and the NBS. They included annual abstracts and other publications. I used

the data from the later sources to augment and authenticate the data obtained from the first and second sources. The fourth source was the publication of the IMFôs Financial Statistics and the World Bank Indicators. The fifth source was data obtained for the port terminals operatorsô websites. These were supplementary to the data already collected and included data from the websites of concessionaires.

Sampling and Sample Size. The study used the entire population of 24 ports as the sample for the study. In computing the sample size using G-Power software, I assumed a total of seven predictors, an alpha Ŭ= .05, and a medium effect size of .15. A computation of sample size with the G-Power software for multiple linear regressions based on these parameters revealed a sample size of 153 observations. There were only 24 privatized ports (20 DMUs) in the population, with observations spread across 8 years, resulting in a total of 160 observations. With this sample size, the study had a good chance of detecting any important effects of the privatization exercise.

Validity and Reliability Issues

Certain features of this study exposed it to possible threats to validity. First, the privatization exercise had already taken place, making it impracticable to have a group of ports to use as the control. Besides, the government privatized all of the ports in the maritime industry at the same time. Second, the manipulation of the variables of the study was also not possible. Third, conducting a pretest before the privatization, as in a true experiment, was also not possible. Due to these features, the design of the study was correlational or ex post facto.

With correlational studies, the random assignment of participants and the manipulation of variables are not possible because the events of interest have already taken place or occurred naturally. The design, therefore, lacks control of the independent variable or variables. In the same vein, it is impossible and impracticable to isolate and control every possible variable that could influence the possible outcomes of an intervention. Furthermore, it is also not possible to be certain that the selected variables for the study are the most relevant variables in the event. Additionally, it is not possible to determine with any certainty whether the causative factor has been included or even identified, thus exposing the study to the possibility of multiple and even contradictory hypotheses. For that reason, it may not be possible to disconfirm any hypothesis. Moreover, the characteristics of comparison, manipulation, control, and generalizability that distinguish pure experiments from other designs are not present with the design. The researcher cannot manipulate the independent variable or randomize the selection. Besides, attempts by the researcher to match groups of the key variable to eliminate rival hypotheses may lead to a shrinking of the sample, thus jeopardizing the generalizability of the result (Campbell & Stanley, 1963; Lord, 1973). As a result of these limitations, it may not be possible to establish the order of influence between variables even where there is a very strong correlation between the variables. It is also possible for a particular outcome to arise from different causes on different occasions.

Shadish, Cook, and Campbell (2002) provided a recipe for these types of studies. According to Shadish et al., a causal experiment must meet some basic conditions for establishing causality. The cause must precede the effects. Next, the cause must covariate with the effects. Additionally, there must be a reduced possibility for having an alternative

explanation of the causal relationship. It is therefore possible for designs that lack random assignment, active manipulation, and rigorous control over extraneous factors to yield strong causal inferences, provided that they meet the above conditions. While the correlational design may not have inbuilt design controls, there are some correlational analysis statistical techniques that provide tools for addressing the dual challenges of directionality and third variables inherent in the design. Regarding the problems of directionality, the available techniques include cross-lagged panel correlation. For the third variable problem, the literature contains recommendations for the use of the partial correlation analysis. The other statistical technique available for reducing the third variable problem is matching, where the researcher matches data from participants with the same characteristics of the third variable (Frankfort-Nachmias & Nachmias, 2008).

Ethical Issues

The data required for this study were from five main secondary sources. The use of these secondary datasets and archival information posed little risk to the participants, which were largely inanimate. According to Law (2005), the major ethical concerns regarding the use of secondary data relate to the issues of privacy and confidentiality. Privacy concerns relate to studies involving only human subjects, which were absent in this study. Confidentiality concerns arise when a study uses certain confidential information, which participant provided for purposes other than those of the study. Examples of such confidential information are those relating to the concessionairesô future strategic and investment plans and currently in the custody of the ICRC. This is the type of information that would interest the competition. In other words, the

participants would not ordinarily have provided such information if the original purpose for doing so had been this particular research. The second concern relates to the use of photographs, charts, and other proprietary materials whose use would constitute a violation of confidentiality. The third concern relates to copyright issues. These three issues create the potential for lawsuits against the researcher, particularly where the results of the study affect public perception of the concessionaireôs or governmentôs compliance with the terms of the concession. The second ethical risk relates to the issue of the validity and credibility of the research, as the research was not the original purpose for collecting the data. The last is the issue of data security and the threat of security lapses inherent in sharing electronic data.

Possible Analytical Strategies

The study used the DEA linear programming model to construct the total productivity index of the ports using longitudinal data. It further made use of the multivariate analysis to determine the impact of the productivity improvements at the ports on economic growth based on the values of the independent, intervening, and control variables (Frankfort-Nachmias & Nachmias, 2008; Laerd Statistics, 2013). The use of longitudinal data made it possible to observe a cross-section of data over time, thereby allowing for both a dynamic as well as cross-sectional analysis of the problem (Frees, 2004). The study additionally used two-stage least square regression analysis to isolate the mechanism through which the ports transmitted economic growth. Multiple regression analysis allows a researcher to determine the extent of the relationship between the dependent variables and some other independent variables. It also permits the determination of the overall fit of the independent variables and their relative

contributions toward predicting the changes or total variance in the dependent variable. Last, the multiple regression analysis additionally allows for analysis where the measurements of the independent and control variables are in different scales by using the standardized score (Frankfort-Nachmias & Nachmias, 2008). For instance, whereas cargo throughput is in metric tons, investment and national debt level are in dollars, and GDP growth, inflation rate, population growth, and interest rate are all in the ratio scales. At the same time, ship turnaround time and ship waiting time are in days, while berth occupancy is on the ratio scale.

Additionally, the study used the time-lagged correlational design or cross-lagged panel correlation to address the problem of the direction of control. With the third variable problem, the use of partial correlation analysis is recommended in the literature.

Definitions

The key variables of the study were the port inputs, namely quay length, terminal area, and equipment, while the output was cargo throughput. Other variables were the privatization variable (PVA), the total efficiency index (EFF), deregulation (DEG), trade openness (OPEN), and an index of corruption or the ratio of government consumption to GDP (GOV). The other variables were the growth rate of real GDP per capita (POP), credit to the private sector as a percentage of GDP (CREDIT), the real interest rate (INT), and the inflation rate (INF). The proxy for trade liberalization or trade openness was the ratio of exports and imports to GDP.

Privatization variable (PVA): Privatization proceeds in this study were the aggregate privatization investment as a proxy for privatization to capture all inflows brought about by the privatization of the ports. This definition captured not only the net proceeds of privatization

received by the government, but also the postprivatization investments by the concessionaire in the form of facility renovation and upgrade, technology, innovation, management, and manpower.

Labor (L): There are two possible measures for labor. The first is the annual growth rate of the population as a proxy for labor. The second is gross secondary school enrollment as a percentage of the population.

Capital (C). The proxy for capital is the gross capital formation in the economy.

Credit (CREDIT): The availability of credit in the economy is a key determinant of private sector investment (Kessy, 2008). In this study, the proxy for credit was the availability of credit to the private sector as a percentage of GDP.

Average productive efficiency score (EFF): The EFF is the score constructed using the DEA model shown in *Equation 18* in Chapter 3.

Inflation (INF): *The Concise Encyclopedia of Economics* defines *inflation* as an ongoing rise in the general price level. Fischer (1993) indicated that inflation serves as ñan indicator of the overall ability of the government to manage the economyò (p. 4). This study included the inflation variable for that reason. Economic theories also regard inflation as a GDP deflator, indicating that the variable suggests a negative relation between macroeconomic stability and inflation (Easterly & Rebelo, 1993; Fischer, 1993).

Government expenditure (GOV): Cook and Uchida (2003) and Filipovic (2005) used government expenditure as an indication of political corruption and bad government. Privatization is one of the measures put forward by the neoliberal school to reduce the influence

of the state in economic policymaking. The underlying argument is that when policymaking rests with organizations whose control is in the hands of politicians, bureaucrats, and interest groups, there is a tendency to make allocative decisions based on self-interest only, thereby producing socially undesirable outcomes (Woo-Cumings, 1999). Thus, the increase in government expenditure under the regime of fiscal constraint is a measure of bad government. This study used the ratio of government expenditure to GDP to control for bad governance.

Trade openness (OPEN): Trade openness was a proxy for trade liberalizations. Privatization, together with trade liberalization and deregulation, formed the key policy prescriptions of neoliberal growth theory. The underlying argument in support of openness to international trade is that it stimulates the ñgrowth of exports and increases the availability of imports, thereby accelerating the economyôs technological development and hence fosters economic growthò (Dollar, 1992, as cited in Ifionu & Ogbuagu, 2013, p. 27). This study used the ratio of exports and imports to GDP as a measure of trade liberalization or openness (Barro, 2000; Calderón & Servén, 2010).

Cargo throughput (CARGO): Cargo throughput denotes the total volume of inward and outward bound cargo processed or loaded and unloaded at a port location during a period under review (Eniola et al., 2014). Statistical records often separate cargo throughput data into import and export. It may also include the quantity of sea-sea transport or transshipment cargo (World Bank, 2004). In this study, cargo throughput was the output variable in the DEA and the economic growth regression analysis.

External debt (DEBT): External debt was a proxy for country risk. DEBT and ñease of doing businessò represented the ability of the country to attract investment from abroad. In the model, DEBT is the ratio of total external debt to GDP (Ifionu & Ogbuagu, 2013).

Quay length: A quay or wharf is a ñstructure built alongside the water or perpendicular to the shore where ships berth for loading or discharging goodsò (Sustainable Management for European Local Ports [SuPorts], n.d., p. 375).

Terminal area: Enriquez (1991) defined a terminal as ña complex of structure, equipment and services, which offers a continuous and flexible response to the service demands of certain types of vessel and cargo, permitting the optimum utilization of manpower and equipmentò (p. 61). Based on this definition, an operational terminal area is the area of land covered by the ñcomplex of structure, equipment, and servicesò (p. 61).

Port equipment: Port equipment is varied and depends on the type of business undertaken at the ports. The port equipment found at the Nigerian ports consisted of quay transfer equipment, yard equipment, and rail infrastructure, where they existed (BPE, 2006; Quansah, 2014). The quay transfer equipment consisted of gantry cranes, mobile cranes, and/or floating cranes, while the yard equipment comprised straddle carriers, rail-mounted gantries, forklifts, reach stackers, and trailers (Hockney & Whiteneck, 1986, as cited in World Bank, 2004).

Assumptions

This study involved some assumptions concerning the choice of variables, research design, and techniques of analysis. In line with the objectives of the ports privatization, I first assumed that the productive objectives of the privatized Nigerian ports are the maximization of

output, and the minimization of inputs. This assumption was necessary to establish the objective function of the seaports where one of the techniques of analysis is the DEA.

Second, based on the objective function of maximization of output or the minimization of inputs, the logical choice of output in DEA is cargo throughput.

Third, the Cobb-Douglas production function that the study used in examining the impact of port privatization efficiency on per-capita economic growth has a basic assumption of constant returns to scale. The assumption of constant returns to scale restricted the studyôs independent variables to two. Although it is possible to extend the growth model to include more than two factors in a modified model, such inclusion would violate the constant returns to scale assumption.

The fourth assumption relates to the model the study adopted in the DEA. The choice of DEA model was the CCR. The CCR assumes constant returns to scale for each DMU or port. The alternative model is the BCC, which owes its name to Banker, Charnes, and Cooper (1984). Whereas the BCC allows for variable returns to scale, the CCR assumes constant returns to scale for each DMU (Kessy, 2008).

Scope and Delimitations

Studies of the privatization phenomenon fall into five major categories. First, there are studies whose major focus is the macroeconomic impact of privatization (Al-Obaidan, 2002; Cook & Uchida, 2003). The second category contains studies that emphasize the impact of privatization on the output, profitability, investment, and efficiency gains of privatized firms (Abdou & Moshiri, 2009; Tunç, 2005). In the third category are studies on the impact of the

privatization methods. The study by Bennett, Estrin, and Urga (2007) exemplifies this category. There are also studies that focus on the determinants of privatization success, such as Plane (1997). The last category of studies concerns the effect of privatization on the distribution of income, employment, and cost of living in the economy (Barro, 1991; Birdsall & Nellis, 2003).

The objective of this quantitative study was to examine the empirical relationship between privatization and economic growth, using longitudinal data on efficiency and productivity from the privatization of Nigerian ports. Specifically, the study established how changes in the productivity efficiency at the ports following privatization affect long-term economic growth in Nigeria. The focus of this aspect of the study was the effect, size, and direction of productivity efficiency changes at the ports the following privatization, together with the mechanism through which privatization transmits its gains at the microeconomic level of the firm to economic growth at the macroeconomic level. The study did not examine the social impact of privatization or the impact of privatization implementation methods.

The population of the study consisted of 24 of the nationôs 26 ports. Although the government had privatized 24 terminals by concession, the analysis in this study involved only 20 DMUs, as some terminals with common operators and locations continued to maintain combined operations and statistics after the privatization. For instance, four terminalsð Apapa Terminal ñA & Bò and Apapa Terminal ñC & D,ò under concession to Apapa Bulk Terminal Limited and ENL Consortium, respectivelyð combined into two DMUs to reflect operational reality. In the same manner, the Onne FLT B and Onne FOT A under concession to INTELS merged into one DMU. The Warri New Terminal B under concession to Associated Maritime

Services ceased operations after 1 year due to the collapse of the quay wall. These developments reduced the number of DMUs from 24 to 20. It is therefore possible to extend the findings to the maritime sectors in other countries.

Limitations

The assumptions of the study introduced some design and methodological limitations. Ports are a very complex business that handles many different types of goods. The Nigerian port system handles dry bulk (wheat, cement), break bulk (general cargo), unitized/container, liquid bulk (oil services) and roll-on-roll-off (all categories of vehicles). Additionally, there are inland container deports. For this reason, ports have different sources of inputs and outputs that make a direct comparison among apparently homogeneous ports seem difficult (Valentine & Gray, 2002). The key approach to the construction of the total productivity index of the ports, the DEA method optimizes output based on a given a set of inputs. The total efficiency score determined through the DEA therefore depends on the inputs and outputs that a study uses.

Besides, the variable nature of data within the different categories of input increases the variability of the result. For instance, in their study, Cullinane and Song (2006) utilized cargo throughput as the output variable. The input variables used by Cullinane and Song were the terminal area in hectares and the number of pieces of cargo handling equipment. These input variables are the proxies for all the other equipment at the ports. In contrast to the work of Chang (1998), who included the number of laborers engaged by the ports in a year, labor did not form part of the input variables in Cullinane and Song (2006). Aside from the complexity of port operations and choice of variables, the assumptions of a fixed relationship between labor and

equipment, together with the assumption of constant returns to scale in the Cobb-Douglas functions, also place a limitation on the results of the study.

Next, the studies used secondary data for the analysis. A primary limitation of secondary datasets and archival data is that they were not designed with this particular study in mind. For that reason, the data may contain errors and discrepancies. In this regard, the study used the triangulation of information to verify the integrity of secondary data. There are other published statistics that the study could have used for authentication. These include data from the International Maritime Organization (IMO), World Trade Organization (WTO), Annual Digest of Trade, and the Central Bank of Nigeria (CBN).

Last, the correlational design lacks random assignment, active manipulation, and rigorous control over extraneous factors, thus limiting the ability of the design to yield strong causal inferences. Although the study used some correlational techniques to resolve the challenges of directionality and third variables, the interpretation of the results requires a lot of caution.

Significance

A review of the literature indicated that scholars and relevant stakeholders have little or no knowledge of the relevance of privatization in developing countries (Al-Obaidan, 2002). In truth, there have been very limited studies on the impact of privatization on the economies of developing countries. Thus, there are a number of possible outcomes from this study. First, the study may enable policymakers in Nigeria to determine the level of confidence they would place in a privatization program as a panacea for economic restructuring and growth. This information may come in handy as the Nigerian government contemplates the privatization of its oil

behemoth, the Nigerian National Petroleum Corporation (NNPC). The NNPC currently contributes over 90% of the countryôs oil exports and foreign exchange (Thurber, Emelife, & Heller, 2010). Second, there are some specific objectives of the government for embarking on ports privatization. These include increasing cargo throughput at the ports and consequently increasing revenue generation for the government by way of dividends, taxes, duties, licenses, and the like from ports operations. Another key objective is to improve the overall operational efficiency and competitiveness of the ports. This objective translates into reducing the ship waiting time and ship turnaround time, increasing berth occupancy, and reducing the cargo handling charges. There is also the objective of reducing the dependence of the ports on the treasury for operations, in addition to fundamentally restructuring the economy (Filipovic, 2005). Policymakers in Nigeria and critical stakeholders will be interested in knowing the extent to which the privatization program has achieved these objectives. Third, where privatization has not resulted in the expected outcomes, policymakers, and stakeholders also want to know the underlying reason. Fourth, the study may enable the World Bank and other development partners to assess their proposition that privatization engenders economic growth even in developing countries (Nellis, 2003).

The ultimate purpose of a policy is to effect some social change. The study combined two threads of privatization studies, namely economic impact, and efficiency studies. Its focus was on the practice feature of social change rather than human ethics. According to Bernerth (2004, p. 3), the intention of the practice feature is to construct or deconstruct theoretical understanding of a phenomenon, using reality borne out of everyday practical experience. The intention is to

either provide support for or induce a shift in legislative policy as it relates to privatization. The government intended to effect some social changes that would have positive effects on society by embarking on privatization. These include, but are not limited to, increasing overall economic growth and growth per capita, increasing the efficiency of economic units, and, by so doing, increasing income, employment, output, and profits, as well as expanding the capital market.

Despite the privatization of about 167 SOEs in Nigeria, very little empirical work is currently ongoing on the extent, or effect size of the impact of privatization on the main economic variables, either as feedback to policymakers or purely in the advancement of knowledge. Besides providing information to the policymaking value chain in Nigeria, other important themes that are likely to emerge from this study include the construction or deconstruction of the theoretical basis for the privatization instrument for purposes of triggering legislative changes or policy reform with the potential for large-scale transformation of the society. The results are also likely to provide the impetus for additional studies, particularly on the effects of privatization and similar market-oriented policies on developing economies, leading to the advancement of knowledge regarding economic growth.

Summary

Nigeria, like most subsaharan African countries, embraced privatization at the insistence of the World Bank and the IMF on the strict implementation of the SAP as a precondition for the provision of an economic relief package. In the process of the ensuing privatization exercise, the government privatized 24 of the nationôs 26 ports. The privatization of the ports in Nigeria was unique in the sense that it covered virtually the whole maritime sector in the country. It,

therefore, presents an opportunity for evaluating the impact of privatization on the economy using complete sectoral data. The objective of this quantitative study was to examine the empirical relationship between privatization and economic growth, using efficiency and productivity data from the privatization of Nigerian ports. Specifically, the study established how changes in productivity efficiency at the ports following privatization affected the short and long-term economic growth of Nigeria.

The approach to the study was nonexperimental, and the design was correlational, with statistical controls. The key method for constructing the total productivity index of the ports was the DEA, which optimized output at the ports based on a given a set of input. The total productive index formed an input into a Cobb-Douglas type economic growth model. The study used the multivariate and two-stage least square regression functions to determine, respectively, ways that development in the port subsector could affect economic growth and establish the channels for transmission. The study additionally used the correlational techniques of time-lagged correlational design or cross-lagged panel correlation, and the partial correlation analysis in controlling for covariates.

The study provided deeper insight into the privatization phenomenon by providing policymakers in Nigeria and elsewhere with the empirical evidence necessary to determine the level of confidence they would place on the privatization program as a panacea for economic restructuring and growth. Further, it may allow Nigerian policymakers to assess the extent to which the ports privatization has met the specific objectives of the privatization exercise, among other outcomes. The social change focus of this study involved constructing or deconstructing

the theoretical understanding of the privatization phenomenon, using reality borne out of empirical evidence. That way, the study may either provide support for the privatization and other structural adjustment programs or induce a shift in legislative policy as it relates to these programs (Bernerth, 2004).

Privatization is essentially a strategy of economic growth. The quest for the sources, forms, and effects of economic growth has been the preoccupation of economists. From the time of Adam Smith (1776), there have been a plethora of theories on the subject of growth. While privatization has existed since the ancient Romans, it only gained prominence about three decades ago, with the resurgence of political conservatism in Europe and North America. In Chapter 2, I explore the theoretical basis and justification for privatization as a growth model, provide the origins or sources of relevant theories, and offer a narrative of the major theoretical propositions.

Chapter 2: Literature Review

Introduction

This literature review presents an examination, analysis, and synthesis of the frameworks and theoretical basis essential in obtaining answers to the main research question: What is the effect of port concession on economic growth? The review covers history, methods, and empirical findings from seminal studies and research. In the review, I also isolate the limitations associated with existing studies and assess the areas and subthemes in which further research was needed.

The literature review consists of six sections, including the introduction. The introductory section introduces the object of the research, restates the problem and the purpose of the research, and provides a synopsis of the current literature that establishes the relevance of the problem. The next section presents the approach used by the study in searching for the relevant literature. This section lists the library databases accessed and search engines deployed. Additionally, the section itemizes the key search terms and combinations of search terms used in gathering relevant literature and describes the scope of the literature review in terms of the years as well as the type of literature sources searched. In the third section, I consider the theoretical foundation of the study. This section states the theories underlying or supporting privatization and provides the origins or source of the theories and a narrative of the major theoretical propositions. The narrative also includes a delineation of the assumptions underlying the application of the theory. Additionally, the section specifies the literature and research-based analysis of how researchers have applied the theory previously in a manner analogous to the

current study, including the justification for the choice of the theory. Furthermore, the section describes how and why the selected theory relates to the present study and how the research question relates to the challenge or builds upon existing theory.

The fourth section of the chapter presents the conceptual framework for the study. The section identifies and describes the frameworks that underlie the study and includes a synthesis of the works of the most important theorists, philosophers, and seminal researchers related to the frameworks. The section further provides key statements and definitions inherent in the applicable frameworks and describes how researchers have applied and articulated the frameworks in previous research. In addition, the section addresses how the current study benefited from this framework. The fifth section presents the review of the literature related to key variables in this study. The section describes the studies related to the key constructs and methodology and methods that are consistent with the scope of the study. It further describes ways that researchers in the discipline have approached the problem, and the strengths and weaknesses inherent in their approaches. The section also provides justification for the selection of the key variables. It also contains evaluation and synthesis of studies related to the key independent variables, dependent variables, and covariates to produce a description and explanation of the known, the controversial, and the gap in knowledge regarding the variables.

Finally, the section contains a review and synthesis of studies related to the research questions. The chapter ends with a synopsis of the major themes in the literature, including a summary of what is known, what is not known, as well as what is controversial. It also includes a description of how the present study filled some gaps in the literature and extended the

knowledge in the discipline. The chapter also ends by providing material connecting the gap in the literature to the approach and methodology presented in Chapter 3.

Research Problem and Purpose of the Study

According to the literature on the subject, the transfer of property rights by the state to the private sector that accompanies privatization promises superior economic performance for countries. The channel of transmission for the superior performance is the enhanced economic efficiency that such transfer of property rights creates (Cook & Uchida, 2003; Filipovic, 2005; Plane, 1997;). The transfer of property rights during privatization creates inducement for the investor to make additional investment with the intention of increasing efficiency. Apparently informed by this theory, the Nigerian government adopted a structural adjustment program early in the 1980s, in the hope of achieving better efficiency and enhanced economic growth (Boubakri et al., 2009). Through the program, the government privatized over 167 SOEs, including 24 seaports. The government also undertook substantial sector deregulations and trade liberalization.

Since the privatization of the ports using the concession strategy 10 years ago, there has been little empirical study on this phenomenon (Obed & Emeghara, 2012; Oghojafor et al., 2012; Okeudo, 2013; Udoka & Anyingang, 2012). Regrettably, this fixation on the impact of the program on output, profitability, investment, and performance indices at the level of the firm ignored the efficiency improvements that serve as the crux of the neoliberal growth argument in support of privatization. Further, very little empirical work is ongoing on the impact of the program on income distribution, employment, or cost of living. More importantly, studies have

failed to establish a relationship between productivity efficiency improvements at the ports following the privatization and economic growth. Additionally, even where the focus has been on the impact on single-port performance indicators, studies have failed to control for threats to internal validity. Thus, it is difficult to establish that postprivatization changes at the ports are indeed attributable to the privatization exercise directly or associated with the influence of the covariates. The objective of the study was to fill these gaps in the literature.

Empirical evidence exists that provides support to the proposition that port privatization induces productivity and efficiency improvements through facility upgrade, innovation, technology, and management (Cullinane, Ji & Wang , 2005). However, studies also exist that indicate reciprocal causality between productivity improvements at the ports and changes in the GDP and other aggregate economic indicators (Seabrooke et al., 2003). The findings in Plane (1997) further complicated the complex web of relationships and cross-causality associated with the port privatization. According to Plane, privatization policy has little or no impact on economies not implementing deregulation and trade liberalization policies simultaneously. This web of interrelationships clearly makes it difficult to distinguish between the postprivatization changes at the ports attributable to the privatization exercise and those associated with other intervening and confounding variables without controlling for the influence of the covariates. The objective of this study was to fill this gap in the literature by controlling for such internal validity issues, which have the potential to invalidate the inference of causality (Campbell & Stanley, 1963; Shadish et al., 2002).

The purpose of this quantitative study was to examine the empirical relationship between privatization and economic growth using longitudinal data on efficiency and productivity from the privatization of Nigerian ports. Specifically, I sought to establish how changes in productivity efficiency at the ports following privatization affected the long-term economic growth of per capita income in Nigeria. Thus, the study tested the proposition that the transfer of property rights by state actors to the private sector incentivizes the latter to make additional investment to improve productivity efficiency. The study first determined whether the privatization of the seaports did incentivize the concessionaires toward making additional investments to improve productive efficiency. Second, the study examined the nature and extent of the changes in the key performance indicators following the privatization exercise. These performance indicators include efficiency change (EFFCH), technical efficiency change (TECHCH), pure technical efficiency change (PECH), scale efficiency change (SECH), and total factor productivity change (TFPCH) (Alp, Banker, Bal, Emrouznejad, & Cengiz, 2013; Esmer, 2008; Kirikal & Tehnikaülikool, 2005). Third, the study established the extent to which the ports privatization has impacted short and long-term economic growth in Nigeria.

Synopsis of Current Literature

Although privatization has existed in one form or another since antiquity, it was first introduced into the modern economic lexicon in the 1950s with the privatization of British Steel by Winston Churchill (Easterly & Levine, 2003; Parker & Saal, 2003). The word, however, gained prominence as a policy instrument with the rise of conservative governments in Britain, the United States, and France in the late 1970s and early 1980s (Starr, 1988). Over the past 30

years, countries have been deploying privatization policy for purposes of structuring and stabilizing their economies in the hope of higher economic performance. On the one hand, the transition economies of Eastern Europe pursued the privatization of their SOEs as a way of quickly transiting from state-controlled to market-driven economies following the disintegration of the former Soviet Union. On the other hand, those of subsaharan Africa embraced privatization as a way of overcoming budgetary constraints, widening current accounts, growing foreign debt, rising inflation, and balance of payment difficulties (Al-Obaidan, 2002). For the latter group, the World Bank and the IMF provided added momentum for privatization through their insistence on the strict implementation of economic reforms including privatization as the precondition for their provision of economic relief packages.

Filipovic (2005) defined ñprivatizationò as a program of activities designed to reallocate assets and economic functions from the public sector to the private sector in an economy. Through such reallocation, governments seek to increase productivity, deepen the domestic capital market, create an expanded and vibrant private sector, and increase foreign and domestic investment (Nellis, 2003). There are several theories in the literature that underlie or provide justification for the spate of privatization of SOEs that has taken place all over the world since the early 1980s. The foremost of these theories is property rights theory, which presupposes that the transfer of property rights from the state to private investors creates the incentive for the latter to make the additional investments necessary to induce increased productive efficiency and ultimately increased shareholder wealth (De Soto, 1993). According to De Soto, property rights appear to be the ñmissing ingredientò that impedes economic development, particularly in

developing countries (p. 5). Without clearly defined and well-protected property rights, according to De Soto, it is difficult for investors to justify an additional investment in any SOE. Formal property rights assure investors of the security of their investment under privatization (De Soto, 1993).

Literature Search Strategy

The search for literature on the object of this study was multidisciplinary. As an instrument of policymaking, privatization is an economic, social, political, and management tool. Its influence pervades all strata of a society. The search for literature, therefore, covered multiple databases found in the Walden University Library and elsewhere. Google Scholar provided a vital link between databases found on the Internet and the Zotero bibliography tool. The databases found in the Walden University Library include Political Science Complete, EBSCO Host, Political Sciences Collection, SAGE Premier, and Social Science Journals. These were the starting point of my search for relevant literature. Other useful databases were Academic Search Complete, Business Source Complete, dissertations, and theses at Walden University. The search also covered other databases such as Academic Search Premier, ProQuest Central, and ProQuest Psychology Journals. Internet searches yielded databases such as JSTOR, Wiley Online Library, PsycINFO, and a host of other similar databases. The World Bank and Public-Private Infrastructure Advisory Facility (PPIAF) databases provided useful information on the history of privatization and trends in privatization.

The keywords used in tracking down relevant articles on the dissertation topic were *privatization*, *policy reform*, *deregulation*, *liberalization*, *economic growth*, and *economic*

development. Others were *efficiency*, *productivity*, *ports*, *production function*, *divestiture*, *property rights*, *SOEs*, *private investment*, and *economic reform*. The search included English publications only. It was difficult to restrict the search to articles and materials dating back 10 years only. The search for literature on growth and economic development included sources published more than 10 years ago in order to capture the historical development of growth theories that have influenced contemporary views on the subject.

Theoretical Foundation

There are several theories in the literature that underlie or provide justification for the spate of privatization of SOEs taking place all over the world since the early 1980s. The foremost of these theories is property rights theory. Property rights theory presupposes that the transfer of property rights from the public to private investors creates the incentive for the latter to make the additional investments necessary to induce increased efficiency, increased productivity, and, ultimately, increased shareholder wealth (De Soto, 1993). Other theories that provide justification for privatization include the Coase theorem, public choice theory, and the principal-agent theory (Cavaliere & Scabrosetti, 2008; De Soto, 1993; Filipovic, 2005; Wright, 1993). When taken together, these theories offer the proposition that the transfer of property rights from the state to the private sector through privatization provides the incentive for the private sector to invest in the acquired SOE through facility improvement, capital injection, innovation, and management. These improvements reflect on efficiency at the microeconomic levels and ultimately impact the economy at the macro levels positively.

Privatization is one of the policy instruments of neoliberal economic theorists, labeled the ñWashington Consensusò by Williamson (1990, p. 1). According to the neoliberal school, the universally valid assumption that individually rational and decentralized decisions dictated by price signals from the market will ultimately lead to an efficient allocation of resources and distribution of income (Woo-Cumings, 1999). The argument advanced by the neoliberal school in support for price determination through unrestricted market equilibrium was two-pronged. The first element of this argument was political, and the other was economic. As the political argument goes, policymaking in most countries rests with organizations whose control is in the hands of politicians, bureaucrats, and interest groups, which make allocative decisions based on self-interest only, thereby producing socially undesirable outcomes (Woo-Cumings, 1999). According to neoliberal growth theory, the extensive intervention of the state to create import-substituting industrialization resulted only in creating inefficient industries that require permanent subsidization for survival (Önik, 1991). The consequence of these suboptimal decisions by the political state is the existence of excess capacity, protection of high-cost producers, rent-seeking costs, and the like (Woo-Cumings, 1999). The neoliberalist economic argument is that the theoretical static efficiency of market forces is far superior to state allocation by policymakers. In other words, allocative and distributive decisions dictated by unfettered market forces not only ensure Paretoôs optimality in the short run (static efficiency), but also lead to long-run growth or dynamic efficiency (Woo-Cumings, 1999).

Following these arguments, neoliberal theorists advocated two closely related policy proposals. The first is economical and supports wholesale liberalization of the economy in the

form of totally unregulated domestic and international markets (Woo-Cumings, 1999). On the domestic front, the policy prescribes total deregulation of all products and factor markets within the economy. Such policy initiatives as sector reforms, privatization, and deregulation were the key strategies of this policy thrust. Neoliberalists also stressed the liberalization of trade, financial markets, foreign direct investment (FDI), and the elimination of barriers to foreign investments (Ezema & Ogujiuba, 2011). Other policy instruments of the neoliberal school included securing of property rights, achieving a unified and competitive exchange rate regime, fiscal discipline, and broadening the tax base. Policy recommendations also included cutting marginal tax rates and creating less progressive tax administration. Creating a social safety net with a focus on the lower income segment of society and developing flexible labor markets also form key policy prescriptions of neoliberalists (Ezema & Ogujiuba, 2011).

Regarding international trade, the neoliberalists prescribed complete liberalization of external trade in line with the principles of comparative advantage. In practical terms, this policy initiative implies the winding-down of the capital-intensive import-substitution industrialization strategy that most developing countries were pursuing previously and replacing them with labor-intensive production (Woo-Cumings, 1999).

The Neoclassical Growth Theory

The neoclassical growth theories emerged as a result of the criticism that accompanied the classical assumptions of laissez-faire. Like the classical theory before it, the neoclassical theory recognized the role of the factors of production in advancing economic growth. The point of departure, however, was on the role of technical progress in the growth process. According to

the neoclassical theory as espoused by Solow (1956) and Swan (1956), the growth of an economy in the long-run is determined by technological progress and scientific process that is outside the economic activities taking place within an economy. Thus, while stressing the primacy of savings and capital accumulation in determining economic growth, their model ascribed long-term growth to technological progress outside an economic system (Solow, 1956). Solow measured long-term growth using the growth rate of output per person. In simple terms, when savings increase, the capital per worker or will increase, resulting in an increase in income per capita in the economy. The corollary is also true. The reason, according to the Solow-Swan model is due to the diminishing marginal productivity of production inputs (Solow, 1956). Diminishing marginal productivity ñholds that if more variable input units are used along with a certain amount of fixed inputs, the overall output might grow at a faster rate initially, then at a steady rate, but ultimately, it will grow at a declining rateò (The Business Dictionary, 2013). As such, sustained growth is possible only through technological progress. Due to the possibility of the existence of the stationary state and diminishing marginal product, neoclassical economists believe that the growth of world economies will eventually convergence at some future time (Solow, 1956).

The neoclassical theory has a lot of empirical support. Baumol (1986) investigated the issues of growth in productivity (and related variables), in 100 developed and developing countries. Baumol found that over the 150 yearsôperiod covered by the analysis, there were astronomical increases in productivity for the 16 nations studied. Second, there was a long run tendency towards convergence of productivity (output per labor hours) among the industrialized

countries studied. However, the convergence is not singular as the neoclassical theory has suggested. Indeed, there was convergence for industrialized countries and somewhat inferior convergences for the command and emerging economies. The developing countries were largely excluded from the homogeneous processes. Third, the productivity levels in 1870 were inversely correlated with the average productivity growth level of the countries studied. Fourth, the convergence did not occur for less developed countries. According to Baumol, the exclusion of the developing countries from the convergence phenomenon was due to their inability to share the benefits of innovation and investment, which industrialized countries share. Industrialized countries find themselves in constant competition for investments, innovation, and markets that the (Schumpeterian race), which the developing countries are excluded. To Baumol, both innovation and investments are the main sources of growth in labor productivity over the period. Sixth, the growth in productivity of the United States (US) has indeed been steady over the years with little signs of a long-term slowdown in labor and factor productivity. Last, the United Statesô productivity growth is comparable with those of Japan, Germany, and some countries. Barro (1996) confirmed the tendency towards conditional convergence of GDP in economic regions.

While noting the conclusion of Barro and Sala-i-Martin (1991, 1992a, 1992b) in their study of Japanese, US, and European regions, regarding the tendency to convergence towards their national steady state at a national average rate of 2%, Button (1998) observed that convergence was not automatic. In his study, Button distinguished between conditional convergence and aggregate convergence. While conditional convergence relates to economies

with dissimilar structures and whoôs GDP do not converge to similar levels, aggregate convergence is more in line with the neoclassical frameworks where regions converge to a common per capita rate due to exogenous technical progress, despite their different initial GDP positions (Button, 1998).

Known also as the neoliberal theory, neoclassical economics asserts that the free movement of goods (free trade), services, and capital unimpeded by government regulations will lead to rapid economic growth. Such a deregulated market space, in the neoclassical view, will increase global output and international efficiency due to the gains from the division of labor. Even modern trade models scholars base their models on the neoclassical trade theory, which assumes perfect competition and concludes that trade, improves welfare generally by improving the allocation of factors of production across sectors of the economy.

The neoclassical school, however, received scathing criticism from Ha-Joon Chang, cited in Woo-Cumings (1999). According to Chang, the school downplayed the issues of market failure, the definition of the free market, and the lack of specification for the free economy. First, the existence of market failure limits the effectiveness of economic and political liberalization in the sense that price determination guided by individual self-interest is unlikely to allocate resources to economic activities that do not guarantee rival consumption, and it is not possible to exclude any citizen from enjoying the benefits of the services. Besides, the free market institutions reflect a system of rewards and penalties that encourage efforts towards socially productive activities. The paradox of this system is that it creates economic efficiency and prosperity where it succeeds. It also leaves a trail of unbridled inequality and inequity as the free

market institutions systematically trade-off equity for economic efficiency and expediency (Woo-Cumings, 1999). Second, there is the problem of defining what constitutes the ñfree marketò. The fact is that what constitutes a free market for labor in the Organisation for Economic Co-operation and Development (OECD) countries where child labor is abhorred will amount to restricted or regulated the market for some developing countries (p. 187). Third, the neoliberal model has no institutional specification for what constitutes a ñfree economyò. The specification in this regard relates to the criteria for participation in the market, rights and duties of participants, and who regulates the relationship (p. 187). Chang also faulted the recommendation for the de-politicization of policy and implementation. The neoliberalists support the view that political interference often leads to populist policies that support uncompetitive industries with overpaid employees and transferring the cost to the rural population in the form of high prices (Woo-Cumings, 1999). While conceding that the politicization of economic policy could lead to abuse by powerful political groups, Chang argued that some degree of politicization may be inevitable and also desirable. Otherwise, implementation will require the use of harsh measures.

Theories Underlying Privatization

This study used the term privatization to describe a program of activities undertaken by policymakers to reallocate the assets and economic functions from the public sector to the private sector, intending to increase productive efficiency, foreign, and domestic investment, among other objectives (Filipovic, 2005; Nellis, 2003). In this sense, privatization is merely a strategy of the neoliberal growth theory (Starr, 1988). It is among the economic policy initiatives, which

include sector reforms, and deregulation of products and factors markets prescribed by the neoliberal school for liberalizing the domestic economy. The recommended policy thrust is a wholesale liberalization of the economy in the form of totally unregulated domestic and international markets (Starr, 1988).

There are several theories in the literature that underlie or provide justification for the spate of privatization of SOEs taking place all over the world since the early 1980s. The foremost of these theories is the property rights theory. Property rights theory presupposes that the transfer of property rights from the public to private investors creates the incentive for the latter to make the additional investments necessary to induce increased efficiency, increased productivity, and ultimately increased shareholderôs wealth (De Soto, 1993). According to De Soto, property rights appear to be the ñmissing ingredientò that impedes economic development, particularly in developing countries. Without clearly defined and well-protected property rights, according to De Soto it will be difficult for investors to justify an additional investment in an SOE. It is the formal property rights that assure investors of the security of their investment under privatization. This study tested the proposition that the transfer of property rights by state actors to the private sector incentivizes the latter to make additional investment to improve productivity efficiency.

Closely related to the property rights theory is the Coase theorem, which proposes that the private sector operators, guided by enlightened self-interest, can arrive at a Pareto-optimal solution through negotiated settlements (Filipovic, 2005). Through private negotiations, parties could arrive at a Pareto-optimal solution, particularly where there are no transaction costs. In

other words, the free market is more efficient at dealing with externalities associated with distributive and allocative activities in the economy. Under such a private arrangement, the role of government and the legal system will be limited to establishing and protecting the rights that would allow the private sector to resolve issues in an efficient manner. The basic shortcoming of the Coase theorem is the existence of transaction costs, which could be very high in the case of privatization. The Coase theorem holds true in the hypothetical world where there are no transaction costs (Stiglitz & Godoy, 2006).

Public choice theory also provided additional justification for privatization. As the theory goes, the legislators and bureaucrats, who make and implement policy, are rational self-maximizers, and generally act in their parochial interests rather than in the public interest. For this reason, the allocative decisions made by the government will always be suboptimal and skewed towards the personal preferences of those in government (Wright, 1993). However, as there is no universally accepted modality for combining the individual preference of member of the society into a unified society preference, it will be inevitable that the state will intervene to prioritize the preferences of the society (Wright, 1993).

The last major theory is the principal-agent theory. This theory sought to provide an explanation for the often observed divergence between the efficiency theories of privatization and the outcomes disclosed by empirical literature. According to the agency principal-agent theory , which was made popular by Sappington and Stiglitz (1987), the transfer of ownership from the state to the private sectors often creates the twin agency challenges of ñmanagerial perquisite consumptionò, and ñentrenchmentò (Cavaliere & Scabrosetti, 2008). According to

Dharwadkar et al. (2000), managerial perquisite consumption alludes to schemes and pecks designed by the managers of privatized SOEs for augmenting their nonsalary income in the short-run or providing other on-the-job consumption for themselves. Entrenchment denotes managerial actions, and practices that diminish the effectiveness of controls put in place by the owners of the privatized SOEs to regulate management behaviors (Asher, Mahoney, & Mahoney, 2005; Walsh & Seward, 1990, cited in Dharwadkar et al., 2000).

Literature and Research-Based Analysis of Theory

Property Rights Theory

The literature on property rights offers many perspectives or definitions. The legal scholar sees property rights as consisting of the legal recourse available to owners of tangible and intangible property against inappropriate action by nonowners (Asher, Mahoney, & Mahoney, 2005). Libecap (1989) cited in Kim and Mahoney (2005) emphasized this view when he defined property rights as ñthe rights to use, to earn income from, and to transfer or exchange the assets and resourcesò (p. 226). Asher et al. (2005) provided a broader definition that incorporates both the legal definition and the social norms and conventions that govern the conduct of business. In their view, property rights are the social institutions that define or delimit the range of privileges granted to individuals of specific resources, such as parcels of land or water. North (1990) supported this view when he defined property tax as:

> The rules of the game in a society, or more formally, are the humanly devised constraints that shape human interaction. In consequence, they structure incentives in human exchange, whether political, social, or economic.

The latter definitions align with the definition of such scholars as Alchian (1965), Barzel (1997), Demsetz (1992) and Gallup, Mellinger, and Sachs (1999). Property rights that could arise from the ownership of an asset include the rights to use an asset, change it form, substance, or location, and to transfer all, or some of these rights (Starr, 1988). Chang (2002) argued that property rights are part of the entitlements that defines the endowment of market participants. In his view, it is the existence of certain institutions or ñlegal infrastructureò that allows market participants to exercise property rights (p. 10). These institutions defined who holds what property rights, who participated in what kinds of exchange in the marketplace, the legitimate object of exchanges, acceptable conducts in the marketplace, together with the terms of the exchanges. According to Chang, it is the establishment of property rights in the 18th century that contributed to the successful early industrialization of the United States.

Asher et al. (2005) identified these institutions, which critically affect decisions regarding the use of resources as consisting of both formal and informal. The formal arrangements comprise constitutional provisions, statutes, and judicial rulings. The informal arrangements consist of conventions and customs regarding the allocations and uses of property in a society. Collier and Gunning (1999), in his assessment of property rights in African societies, distinguished between traditional and marketable rights. Whereas traditional customs and norms guide the transferability of property rights under traditional rights, it is the legal infrastructure of the state that governs marketable rights. The rights to property are universal when the entire society owns the scarce resource. Property rights could also be exclusive when owned

exclusively by a single individual. Last, property rights are transferable (Kim et al., 2005, citing Demsetz, 1967).

The variety of rights associated with the private ownership of resources includes the right to exclude nonowners from access, and the right to contract, or invest in the asset with the intention of earning some income or economic rents from the use of and investments in the resource. Other rights include the rights to sell, gift, bequest, or otherwise transfer the resource to others (Alchian, 1965; Demsetz, 1967).

The literature on property rights dates back to the late 1950s and early 1960s, with the seminal works of Coase (1959, 1960). Other major contributors to the theory include Alchian (1965, 1969), Cheung (1968, 1969, 1970), De Alessi (1987), Demsetz (1964, 1966, 1967), and Furubotn and Pejovich (1972, 1973, 1974) were also major contributors to the theory (Kim et al., 2005). These classical theorists hold the view that the differences in organizational behavior arise strictly from the individual incentives created by the structure of property rights (Starr, 1988). All other organizational characteristics such as size, centralization, hierarchy, or leadership are irrelevant in determining the performance of an organization.

These theorists argued that first; it is only the rights to property that provides for the varying performance of different organizations. Second, the prices of stocks and bonds determined by the stock market are the benchmark for determining the performance of a company. Third, the market for corporate control is highly efficient owing to the fact that the major reason for acquiring corporations is to change a weak-performing management (Starr, 1988). According to these classical theorists of property rights, it is difficult to judge the value of

SOEs as they do not have stock exchange listing. SOEs are notorious failing to measure up to that standard set by the market. Thus, it is the ability of an organization to survive in the market will depend on its adeptness in generating profits for the owners. According to the classical theory of property rights, the reason for the underperformance of SOEs arose from the fact that expectation of profitability is not a requirement for SOEs.

The modern contribution to the property rights theory emphasizes the ownership rights to property in an incomplete contract setting. It uses ñadvanced mathematical tools, attempts stylized modeling of ownership and incentive structuresò (Kim et al., 2005, p. 224). Major contributors to the modern view of property rights include Alston et al. (1996), Barzel (1982, 1997), Cheung (1983), Eggertsson (1990), Libecap (1989), Mahoney (2005), North (1981, 1990), and others.

Rationale for the Choice of the Theory

Property Rights Theory and Privatization

Property rights theory offer the proposition that the transfer of property rights from the public to private investors creates the incentive for the latter to make the additional investments necessary to induce increased efficiency, increased productivity and ultimately increased shareholderôs wealth (De Soto, 1993). Empirical evidence exists to support this proposition. In his assessment of the effectiveness of privatization as a policy option for promoting economic growth, Filipovic (2005) found that the property rights conveyed through privatization create a strong incentive to invest in productivity and efficiency improvements. Privatization also encourages wider ownership and increases the incentive to pursue longer term goals.

This study examined these propositions, and further tested the neoliberal theory that the wholesale liberalization of the economy in the form of private ownership of state assets such as seaports is a significant predictor of economic growth.

Research Question and Property Rights Theory

Research question(s) and hypotheses. The central research question of the study was the following: What is the effect of port concession on economic growth? The subquestions that derived from the main question were as follows:

1. What is the effect of the postprivatization investment on productive efficiency of the ports after privatization?
2. To what extent does the postprivatization productive efficiency of the ports predict changes in GDP, GDP growth, GDP per capita, and GDP per capita growth?

The study used the DEA-Malmquist analysis to construct the productive efficiency index for the port after the privatization exercise. The latter scores served as input into a multivariate growth regression to determine the relationship between the port sector and economic growth.

Null and alternative (research) hypotheses.

Hypothesis 1. The level of investments at the Nigerian ports that accompanied their privatization can accurately predict the portsô efficiency index.

H_o: $б_1 < 1$ (the total factor productivity $б_1 < 1$)

H_1: $б_1 > 1$ (the total factor productivity $б_1 > 1$)

Hypothesis 2. A causal relationship exists between the linear combination of the portsô total efficiency index, institutional factors, trade openness, the index of corruption, credit to the

private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput and the level of the GDP in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1$ Í 0 (at least one coefficient $б_1$ Í 0)

Hypothesis 3. A linear combination of total efficiency index, institutional factors, trade openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could accurately predict the GDP growth in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1$ Í 0 (at least one coefficient $б_1$ Í 0)

***Hypothesis 4*.** The linear combination of the total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could explain the variations in the level of the GDP per capita in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1$ Í 0 (at least one coefficient $б_1$ Í 0)

***Hypothesis 5*.** The linear combination of the total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate,

privatization proceeds, and cargo throughput could accurately predict the GDP per capita growth in Nigeria.

H_o: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $\beta_1 \neq 0$ (at least one coefficient $\beta_1 \neq 0$)

Where β_1 = total efficiency index; β_2 = institutional factors; β_3 = trade openness; β_4 = index of corruption; β_5 = credit to the private sector; β_6 = real interest rate; β_7 = inflation rate; β_8 = privatization proceeds; and β_9 = cargo throughput.

Analysis of Application of Theory

Empirical studies reveal a causal relationship between privatization and efficiency in economies with well-developed institutions and markets structures (Boardman & Vining, 1989, Sheshinski & López-Calva, 2003, Vickers & Yarrow, 1991, cited in Cavaliere & Scabrosetti, 2008). However, the results varied widely with the empirical studies on privatization in economies with poorly developed institutions and market structures (Filipovic, 2005; Plane, 2007). A significant proportion of existing studies focused on the efficiency gains of privatization at the firm level, with very few studies devoted to economic growth and distributive effects of privatization (Megginson & Netter, 2001). A review of these studies indicates that scholars are yet to agree on the nature of the relationship between privatization and economic growth. Megginson and Netter attributed this divergence in the conclusions reached by the various studies as reflective of differences in research designs, availability and consistency of data, and the validity and reliability of data.

The impact of privatization on subsaharan Africa countries, particularly in the transportation sector had received scant theoretical and empirical attention from scholars, except in relation to productivity and efficiency effect of the ports privatization program in Nigeria using the single-port performance indices. These studies include Adi et al. (2013), Obed and Emeghara (2012), Oghojafor, Kuye, & Alaneme (2012), and Okeudo (2013). While these studies found a strong correlation between privatization and productive efficiency at the ports, a review revealed third variable problems, as well as other validity and reliability issues.

Conceptual Framework

The Concept of Privatization

Privatization is a concept covering a wide range of ideas and policies (Starr, 1988). Although privatization has existed even in ancient times, the term gained prominence with the rise of conservative governments in Britain, the United States, and France in the late 1970s and early 1980. The current use of the term privatization was the product of the resurgence of the conservative counter-movement in the Western world, intent on reining-in the growing prominence of the government in economic policymaking. The neoliberal theory of economic growth provided the ideological foundation for privatization. According to Starr (1988), the term has two meanings. In the narrow sense, privatization refers to a shift in the production of goods and services from the public sector to the private sector.

In this sense, the term public sector covers all agencies and departments of government that the State administers while the private sector comprises commercial firms, ñinformal and domestic activities, voluntary associations, cooperatives, and private nonprofit corporationsò (p.

14). Starr suggested that the shift of production to the private sector must arise from a deliberate action of government. It, therefore, follows that such demand-driven private sector participation in services delivery in activities not adequately covered by the state does not qualify as privatization (p. 14).

There are four types of activities that Starr (1988) identified that could result in a shift of production from the state to the private sector. The first is implicit, and occurs when the government ceases a public program, disengages in specific government activities or attrition. Attrition involves the restriction of the volume, availability or quality of a public service. The shift is explicit when it involves the transfer of a public asset to the private sector through sale or lease of public land, infrastructure or enterprise. The third form of direct action involves the financing of public services by the private sector or contracting out. A good example is the construction and operation of a penitentiary. The last form of direct action by government is the deregulation of entry into economic activities previously considered as monopolies (Starr, 1988).

Privatization in the broader sense means a shift of the functions or activities of the State from the State to the private sector. These functions and activities include the production of goods and services as in the narrow definition; the establishment of legal frameworks; regulation of social and economic activities; and provision of financial services. The broad definition also covers ñall reduction in the regulatory and spending activities of governmentò (p. 14).

This study used the term privatization in the narrow sense, to refer to a shift in the production of goods and services from the public sector to the private sector. Such a shift is explicit, and involves the direct transfer of a public asset to the private sector through sale or

lease of public land, infrastructure, or enterprise. The privatization exercise often involves direct action by government at deregulating entry into economic sector or activities previously considered as monopolies.

Privatization methods. There are two key factors that determine the method of privatization that countries pursued as they shift the production of goods and services from the state to the private sector such as the divestment from nonperforming SOEs. These are the initial economic conditions that a country finds itself, and the economic ideologies pursued by the country (Filipovic, 2005). The methods identified by Filipovic (2005) include (a) sale of SOEs to private investors or core investor sale; (b) voucher privatization; (c) employee or management buyout; and (d) restitution by way of returning the property rights to the SOEs to their original owners.

For countries facing severe budgetary constraints, widening balance-of-payment difficulties, mounting foreign debt, and rising inflation, privatization was the silver bullet to economic transformation, going by the economic prescriptions of the IMF and the World Bank. Some of these countries, particularly those from subsaharan Africa also had an underdeveloped financial market, poorly developed capital markets and institutions of the State. For these countries, the privatization method of choice was the core investor sale. Under this method, the state decides the SOEs to privatize and uses the market mechanism to procure private investors through share sales. According to Poole (1996) the Jamaican government used this method successfully to privatize a bank within three months. The major advantage of the method is its ability to generate the much-needed revenue for government quickly. At the same time, the

method exposes the SOE to immediate private sector investment, technology, innovation, and management (Filipovic, 2005).

Following the collapse of the Soviet Union in the early 1990s, the transition economies of Eastern Europe needed to transit from state-controlled economies inherited from the Soviet Union to market-driven economies quickly. Thus, they needed a privatization method that will have the highest immediate impact (Bennett, Estrin, & Urga, 2007). The voucher approach provided such a method. This approach allowed eligible citizens to receive share voucher, which they could dispose of through sales or exchange for the shares of other SOEs undergoing privatization. The countries of Central and Eastern Europe (CEE) used the method widely during the post-Soviet era to make a clean break from their communist past (Bennett et al., 2007). The method allowed the CEEs to privatize a large proportion of SOEs within a short period, which the World Bank (2002) pronounced the process as very successful.

Under the third privatization method, the management buyout (MBO), the government sold the SOEs to the managers and employees of the SOEs, who are already familiar with the enterprise, at extremely low prices. The objective of the government in this regards was continuity rather than revenue as the method generated very little revenue for the government (Filipovic, 2005). Slovenia used the MBO to transfer many of its SOEs to state-owned institutional investor or SOEôs employees at highly subsidized prices (Mitra, Selowski, & Zalduendo, 2009)

The last type of privatization method is the restitution method. Under this method, the government transferred the property rights in a previously nationalized company to the original

owner. The restitution method was not a very popular method (Stirbock, 2001, cited in Filipovic, 2005).

Port privatization and economic growth. There is empirical evidence that port privatization induces productivity and efficiency improvements through facility upgrade, innovation, technology, and management (Cullinane et al., 2005). However, some studies show that changes in the gross domestic product (GDP) and other aggregate economic indicators could lead to productivity improvements at the ports Seabrooke et al., 2003). Other studies also indicate that the converse is true (Udoka & Anyingang, 2012). The GDP is also dependent on the level of investment and productivity, and efficiency changes brought about through the privatization of the ports. With this reciprocal causation between the variables at play in ports privatization, it is difficult to determine the postprivatization effects attributable to the privatization exercise directly and those associated with other intervening variables without controlling for the influence of the intervening variables. Empirical studies also reveal that privatization-induced investment has little or no impact on the economy where the government is not embarking on deregulation and trade liberalization simultaneously (Plane, 1997)**.**

Private sector participation in the ports. The privatization of seaports has been ongoing throughout the world since the early 1980s. According to (Cullinane et al., 2005), very few ports in the world have been immune to the phenomenon. By1997, about 88 of the worldôs top 100 container ports had undergone privatization. The wave of privatization swept through ports in Asia, North America, Europe and South America. The privatization of Nigerian seaports followed suit between 2004 and 2006.

The underlying reason for the privatization of ports is the quest for increased efficiency. The theoretical basis for the efficiency argument rests on the neoliberal proposition that the unfettered forces of demand and supply in the market are capable of securing full employment of all economic resources. According to the argument, in a free and competitive market made up of large numbers of buyers and seller interacting freely, with each participant acting in their self-interest, the prices determined in the market is capable of governing resource allocation and income distribution decisions in the society. In other words, the Adam Smithôs invincible hand of the market is capable of regulating demand and supply, allocating production resources, and distributing wealth (Lowe, 1954).

Other reasons for the privatization of ports include reducing their dependence on the Treasury for routine port operations; increasing government revenue generated at the ports; bringing about fundamental structural change in the economy by formalizing and establishing property rights, together with expanding the depth and breadth of the capital market (Filipovic, 2005).

The degree of private participation in the privatization of ports varies considerably. The first mode of participation is an outright purchase of the seaport, with concomitant ceding of ownership and control by the State. Second, the private sector could obtain the control and operation of the ports for some years while the State retains ownership (Davis, 2007). Some forms of privatization involve private participation in the step-by-step measures taken to reposition a port for enhanced efficiency and competitiveness (Cullinane et al., 2005).

Trade Liberalization

Following the argument that unfettered forces of demand and supply in the market are capable of securing full employment of economic resources, the neoliberal growth theorists advocated the total liberalization of all products and factor markets in the economy. The theorists also advocated for wholesale liberalization of international trade in accordance with the principles of comparative advantage, and the de-politicization of policymaking (Lowe, 1954; Lanza, 2012; Woo-Cumings, 1999). Scholars use the ñOpenness to international tradeò as a proxy for trade liberalization (Gossman and Helpman, 1992; Sachs and Warner, 1997, cited in Ifionu & Ogbuagu, 2013). The underlying argument is that openness to international trade in an important stimulus for the growth of exports and availability of imports, both of which accelerate economic growth. In the literature, the proxy for ñtrade openessò is the ratio of the sum of exports and imports to GDP (Ifionu & Ogbuagu, 2013).

Deregulation

The neoliberal school argued that the de-politicization of economic policymaking will allow the forces of demand and supply in the market to regulate the allocation of resources and distribution of income. Therefore, the neoliberalists advocated the removal of political control from all sectors of the economy to allow for a free and efficient marketplace (Woo-Cumings, 1999). The argument offered by the in support of this antidote is that political interference in policymaking leads to populist policies that support uncompetitive industries with overpaid employees, and a transfer of the additional cost to the rural population in the form of higher prices. Some of the policy initiatives in support of deregulation include the elimination of

barriers to FDI and monopoly sectors and the deregulation of the legal framework (Ezema & Ogujiuba, 2011). There is a dearth of literature on the appropriate proxy for the effects of deregulation. However, Countouris and Freedland (2013) argued that one of the effects of deregulation is the introduction of ñflexibilityò into the marketplace and a reduction in the cost of conducting business. It is for this reason that this study used ñdistance to frontier scoreò developed by the World Bank for ranking countries in its Ease-Of-Doing-Business index as a proxy for the effects of deregulation.

Ease of Doing Business

In 2004, the World Bank introduced the Ease-of-doing-business index that uses the ñdistance to frontierò score ranks countries in terms of the gap between each economyôs performance and the best performance on each indicator (Jayasuriya, 2011, p. 6). The ten indicators used by the World Bank in computing the distance to frontier score measures efficiency of regulations that affect small and medium-sized enterprises operating in two largest business city of an economy. The indicators measure efficiency regarding procedures, time, cost in ñstarting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts and resolving insolvency. Doing Business also measures labor market regulation, which is not included in any of the aggregate measuresò (Business, 2014, p. 2) Although the World Bank does not claim the existence of a causal relationship between the Ease of doing business ranking and economic growth, it does concede that good business ethos facilitates the flow of FDI into an economy. Empirical studies have found a causal relationship between FDI

and economic growth (Forte & Moura, 2013; Ifionu & Ogbuagu, 2013; Mencinger, 2003; Yang, 2008). Jayasuriya (2011) provided empirical support for this assertion.

Institutions

William Easterlyôs critical synthesis of the state of contemporary empirical knowledge on economic growth in Wacziarg (2002), identified institutional factors as germane to economic growth. Unlike other endogenous and exogenous factors that affect economic growth, institutions are a complex set of deep social arrangements that influence economic growth. Institutional factors include the rule of law, enforcement of contracts, property rights, social norms, allocation of resources and advanced technological knowledge. Other institutional factors include full disclosure of transaction, low transaction cost, resolution of the problems of externalities, and the like (Asher et al., 2005; Collier & Gunning, 1999; Easterly & Levine, 2003, 2003). Institutions affect economic development through (a) the establishment of clear and enforceable property rights; (b) keeping transaction costs low; and (c) reducing the threat of coercion (Brunetti & Weder, 1994; Henisz, 2000). The quality of institutions within a country correlates strongly with economic development and determines whether development takes place in the first instance.

There is a growing body of knowledge supporting the notion that the quality of the institutions in a country, particularly the ñrule of lawò, strongly affects a countryôs ability to develop economically. Despite the regularity of its use in everyday discussion, the term ñrule of lawò could refer to different concepts. Depending on the context, the rule of law could mean the ñrule according to lawò; ñrule under the lawò; and ñrule according to a higher authorityò (ñRule

of law,ò n.d.). In the first context, the rule of law takes its meaning from Article 39 of the Magna Carta (1215) and implies that a person shall not suffer persecution or punishment except in strict accordance with established laws. In the second context, the rule of law recognizes that nobody or branch of government is above the law. In the third and normative context, the rule of law denotes certain unwritten by universally accepted principles of fairness, equity, morality and justice that goes beyond the mere administrative arrangements of man (United States Institute for Peace, n.d.). In the context of the institutions within a country, the rule of law denotes the equality of all citizens before the law and the application of due process of the law. It is in this context that the rule of law, together with other institutions determine the pace and direction of economic development.

Institutions differ from government policies that are directly under the control of policymakers. Bad policies include high black-market premiums, a large share of government spending in GDP, fiscal deficits and public debt, very high inflation, and protectionist trade policies. These correlated negatively with growth and with each other (Wacziarg, 2002). The jury is still out on policies such as trade liberalization, protectionism, import substitution, and the like.

Key Theorists and Researchers Related to Privatization

The key empirics, theorists and scholars on the privatization phenomenon include Cook and Uchida (2003), Al-Obaidan (2002) and Abdou and Moshiri (2009), whose focus was on the macroeconomic economic impact of privatization. There are other studies that emphasized the impact of postprivatization on output, profitability, investment, and efficiency gains at the

microeconomic level or the level of the firm (Abdou & Moshiri, 2009). Megginson and Netter (2001) reviewed 70 of such studies including Boubakri and Cosset (1998), DôSouza and Megginson (1999), and Dewenter and Malatesta (2001), all cited in Megginson and Netter (2001). Others are Otchere (2002), Boubakri and Cosset (2002), Laurin et al. (2004), and Tunç (2005). The third category of empirical studies examined the impact of privatization methods. Studies by (Bennett et al., 2007) exemplify this category of studies. There are also studies on the determinants of privatization success. The study by Plane (1997) is typical of the latter studies. The last category of studies was on the effect of privatization on the income distribution, employment, and cost of living in the economy. These include studies by Birdsall and Nellis (2003) and (Barro, 1996).

Key Statements and Definitions Inherent in Privatization

Privatization on its own had very little impact on economic growth. However, privatization with a high content of FDI had a positive impact on economic growth (Filipovic, 2005). The effect of privatization on capital formation varies from region to region, country to country and has a temporal dimension (Abdou & Moshiri, 2009). Developing countries could upscale their economic performance by as much as 45% if they convert their economics from state control to market-based structure (Al-Obaidan, 2002). There is a robust negative correlation between privatization and economic growth in developing countries (Cook and Uchida, 2003). However, Cook and Uchida (2003) did concede that it is possible for privatization to lead to other structural changes in the economy, but this area required further studies to confirm. Privatization has a positive effect on GDP growth (Plane, 1997).

The stronger the level of competition in a country, the more effect privatization will have on economic growth (Filipovic, 2005). The ability of a country to strengthen institutions, create a transparent environment and promote appropriate internal policies combines with other policy reforms to ensure the success of privatization (Plane, 1997).

Abdou and Moshiri (2009) utilized World Bank data on privatization for 105 countries from 1988 to 2003, and deployed two-stage least square and simple regression in its analysis. Al-Obaidan (2002) utilized the concept of production possibility function to estimate the efficiency gains of 45 developing countries (Al-Obaidan, 2002).

The empirical studies on efficiency effect of privatization employed different methodologies, and the type and quality of data used in these studies vary widely (Megginson and Netter, 2001). The validity of the studies was, therefore, are limited by the multiplicity of methodologies employed, availability and consistency of data and the possibility of sampling bias. Further studies would be required to address the issue regarding the exact causes of improvements (Filipovic, 2005; Megginson and Netter, 2001) while supporting this view, observed the nongeneralizability of the result of his study due to the limited period covered.

Of all the various methods used over time to carry out privatization, the voucher method had the greatest impact on economic growth. The other methods of privatization as including economic restitution, core investor sale, management-employee buyout (MEBO), lease buyback and voucher (share sale) privatization (Bennett, Estrin, & Urga, 2007).

Income inequality increased after privatization. The rate of increase in inequality depends on the method of divestiture employed for the privatization exercise, the type of the new owners

(individual investors versus management-employee buyouts), the sequence and other types of reforms accompanying privatization; and the nature of the institutional framework for the privatization (Birdsall & Nellis, 2003). The opportunity, therefore, exists for extending the study to cover other regions and conduct more in-depth distributional impact studies.

How the Current Study Benefited From This Framework

The aim of the study was to establish the causality between privatization and the GDP growth; and the rate of growth in GDP per capita empirically. While the GDP is a measure of short-term economic growth, GDP per capita growth is a measure of long-term economic growth. First, the study determined the extent to which improvements in facility upgrade, innovation, technology, and management made by concessionaires after the privatization have improved efficiency and productivity at the ports. Second, the study determined the statistical significance, effect size, and the direction of the relationship between changes in efficiency and productivity variables, the GDP, and GDP growth. The study extended the inquiry to include the effect of the efficiency and productivity variables, the GDP per capita, and the GDP per capital growth.

Studies such as Cullinane et al.(2002), Cullinane and Song (2002), Cullinane et al. (2005), Cullinane et al. (2006), Cullinane and Wang (2006), Estache, González, and Trujillo (2002) and J. Tongzon and Heng, 2005) provide empirical evidence that port privatization does induce productivity and efficiency. There are also studies which show that changes in the GDP, and other aggregate economic indicators could lead to productivity improvements at the ports, particularly the cargo throughput (Seabrooke et al., 2003). The converse is also true that

improvement in cargo throughput correlates positively with GDP growth (Udoka & Anyingang, 2012). There is additional empirical evidence that the GDP depends on the level of investment, productivity, and efficiency changes brought about by the privatization of the ports. This web of interrelationships and reciprocal causation between the contending variables in ports privatization reflects the in determining the true effects of privatization without controlling for the third variables. These variables at play in port privatization include the ease of doing business, trade liberalization, deregulation and institutional factors.

A review of existing literature indicates that privatization-related studies that are relevant to this study are those relating to the economic impact of privatization, and those that that focused on the impact of postprivatization efficiency of the ports at the level of the firm. Studies such as Abdou and Moshiri (2009), Al-Obaidan (2002), Cook and Uchida (2003), and Filipovic (2005) fall into the first category. The second category includes about 70 studies examined by Megginson and Netter (2001). Cook and Uchida (2003) analyzed the impact of privatization on economic growth across 63 countries for nine years. The study concluded that privatization had a negative correlation with economic growth in developing countries. Cook and Uchida, however, conceded that privatization could lead to some structural changes in the economy, but suggested that the criteria for achieving this structural change should be the object of further studies. Filipovic (2005) studied the effects of privatization on per capita growth in 94 countries and arrived at some interesting conclusions. First, privatization on its own is not a significant predictor of economic growth, although it could be when the proceeds have significant content of foreign direct investment (FDI). Second, core investors in a privatization exercise will not be

incentivized to making additional investments if property rights are weak in a country. Third, the existence of strong competition in a country tends to multiply the effect privatization. Last, the effect of privatization depends on the strength of other reforms such as deregulation and trade liberalization.

The implication of these finding is that the success of any privatization exercise is contextual and cannot happen to the exclusion of other policy initiatives. Filipovic (2005), however, conceded that due to limited data, the result of his study cannot be generalized. In their analysis, Abdou and Moshiri (2009) analyzed the impact of privatization on capital formation in 105 developing countries. Their conclusion was that the effect of privatization on capital formation is contextual, depending on the region, country and the timing of the privatization. They also reached the conclusion that the level of postprivatization investment is not significant in predicting growth. Al-Obaidan (2002) provided a quantitative measure of the macroeconomic effects of privatization and concluded that developing countries can raise their economic performance by as much as 45% by transiting from state-control to market-based economies. The designs of all these studies were variants of multiple regression analysis using the basic economic productivity models.

The framework establishes by these three categories of studies informed the design and methodology of the current study.

Literature Review Related to Key Variables or Concepts

The dependent variables in this study are the GDP, GDP growth, GDP per capita and the growth rate of real GDP per capita while the independent variables are total efficiency index,

institutional factors, trade openness, and index of corruption. Other independent variables are credit to the private sector as a percentage of GDP, real interest rate, inflation rate, privatization proceeds, and cargo throughput. The proxy for trade liberalization or trade openness is the ratio of exports and imports to GDP (Calderón & Servén, 2010; Barro, 2000). This study used the ñdistance to frontier scoreò developed by the World Bank for ranking countries in the ease-of-doing-business index as a proxy for the effects of deregulation. The ease-of-doing-business index measures the efficiency of regulation regarding procedures, time, and cost as they affect small and medium-sized enterprises operating in two largest business city of an economy.

Justification for Selection of the Variables

The dilemma faced by most growth empirics is that growth theories do not provide any guidance on variables to include in any growth study (Boubakri et al., 2009. There are as many variables or a combination of variable relating to growth as there are empirics. Levine and Renelt (1992) cited in Boubakri et al. (1992) declared that they found over 50 variables that significantly correlated with growth in a single study. The list includes initial conditions, policy variables and institutional variables but most include ñinvestment, population growth, initial per capita GDP, and initial human capitalò (p. 5). Cook and Uchida (2003) analyzed the impact of privatization on economic growth across 63 countries for nine years while controlling for covariates. The variables in their growth regression included the proxy for trade liberalization (openness), FDI, political stability, inflation, government consumption and public debt. They also included liquid liabilities as a proxy for financial sector development, budget deficit or

surplus, GDP growth per capita and population. In the study, Cook and Uchida (2003) concluded that privatization has a negative correlation with economic growth in developing countries.

Filipovic (2005) suggested that as the conclusion reached in Cook and Uchida (2003) runs counter to the findings from similar studies and theory; there must be a problem with the model used by the researchers. Cook and Uchida (2003) further concluded that it is possible for privatization to lead to other structural changes in the economy, but the criteria for this should be the object of further studies. In a similar study, Filipovic used a total of 18 variables including initial GDP per capita growth rate, GDP in the initial year, average population growth rate, the ratio of government consumption to GDP, total savings as a percentage of GDP, gross secondary school enrollment ratio and inflation of consumer prices. Other variables include government budget balance as a percentage of GDP, total national debt as a percentage of GDP, aid for development per capita measured in US Dollar in year and privatization proceeds as a percentage of GDP and FDI as a percentage of GDP. The author also used the percentage of individuals who expressed the lack of confidence in courts to uphold property right and the intensity of local competition.

The variables used by Abdou and Moshiri (2009) and Al-Obaidan (2002) in their studies were the ratio of investment to GDP, the growth rate of real GDP, per capita income, credit to the private sector as a percentage of GDP and the real interest rate. Other variables are the ratio of public investment to GDP, percentage change in GDP deflator, the ratio of external debt service payments to exports of goods and services, the ratio of external debt to GDP, the terms of

trade and privatization revenue as a share of GDP. The design of these studies was variants of multiple regression analysis based on the basic economic productivity models.

It is noteworthy that, Al-Obaidan (2002), Abdou and Moshiri (2009), Cook and Uchida (2003), and Filipovic (2005) all used privatization proceeds as the proxy for privatization. Privatization proceeds are the gross receipts by the government from the sale of assets less extra-budgetary management expenditure necessary to bring about the sale (Davis, Richardson, Ossowski, Barnett, & others, 2000). However, privatization proceeds are only a fraction of the investment inflows arising from privatization, most of which takes place after the privatization exercise. With the former measure as proxy for privatization, it is hardly surprising that some of the studies on the impact on growth such as Cook and Uchida (2003) did not find a significant relationship between privatization and growth. This study used the aggregate privatization investment as a proxy for privatization to capture all inflows brought about by the privatization of the ports. This definition captured not only the net proceeds of privatization received by the government, but also the postprivatization investments by the concessionaire in the form of facility renovation and upgrade, technology, innovation, management, and manpower.

Research designs for efficiency gains in existing literature fall into two major categories, namely parametric and nonparametric approaches (De Borger, Kerstens, Moesen, & Vanneste, 1994). Popular models of the parametric and the nonparametric approaches are respectively the stochastic productivity function (SPF) and the data envelopment analysis (DEA). Greeen (1997) cited in Porcelli, (2009), described SPF as "the frontier production function is an extension of the familiar regression model based on the microeconomic premise that a production function

represents some ideal, the maximum output attainable given a set of inputs" (p. 16). Studies, including Estache et al., (2002), Cullinane and Song (2006), Tongzon and Heng (2005) and Hung et al., (2010), all use the SPF or variants in their designs. All the studies measured changes in berth capacity, technology, labor, and cargo throughput before and after the privatization. The DEA, which also optimizes output based on a given set of inputs, is more popular with empirics of efficiency gains in specialized containerized ports (Cullinane & Wang, 2006, cited in Hung, Lu, & Wang, 2010).

Studies Related to the Key Variables

In the literature on privatization, only a handful of studies focused on the impact of privatization on economic growth. This scant literature on growth includes Abdou and Moshiri (2009), Al-Obaidan (2002), Cook and Uchida (2003), Filipovic (2005) and Plane, (1997). Except for Cook and Uchida (2003) who observed a robust negative correlation between privatization and growth in developing countries, other scholars observed various degrees of causality between privatization and growth. Filipovic (2005) found that privatization is not a significant predictor of economic growth on its own, although it could be with a high content of FDI. Empirics of growth also agree that investors will not be incentivized to make additional investment if property rights are weak in a country (Filopovic, 2005; De Soto, 1993). Another area of agreement by scholars is that the existence of strong competition in a country tends to multiply the effect privatization. The impact of privatization also depends on the strength of other reforms such as deregulation and trade liberalization.

The import of these findings is that the success of any privatization exercise is contextual and cannot happen to the exclusion of other policy initiatives. In his assessment of the determinants of successful privatization and the economic growth impact of privatization, Plane (1997) concluded that privatization has a positive effect on GDP growth, but the success of a privatization program depends on the ability of the implementing government to strengthen institutions and property rights, create transparent environment and promote appropriate internal policies. Regrettably, the existence of strong institutions, well-protected property rights, and transparent operating environment are not the regular features of developing countries. Abdou and Moshiri (2009) agreed with Al-Obaidan (2002), Filipovic (2005), and Plane (1997) on the positive effect of privatization on growth but observed the effect varies from region to region, country to country and differs with time.

Studies on port efficiency used capital investments, berth capacity, staff strength, and innovation as inputs and cargo throughput as the output in their various analyses. These studies include Cullinane, Ji and Wang (2005), Cullinane and Song (2006), Estache, González, and Trujillo (2002), and Tongzon and Heng (2005). Studies that emphasized productivity and efficiency effect of the ports privatization program in Nigeria used privatization proceed, berth capacity, berth occupancy, the ship waiting time, ship turnaround time, cargo handling charges and cargo throughput and other single-port performance indices in their analysis. These studies include Adi, Ndukwe, Iheanachor, and Dim (2013), Obed and Emeghara (2012), Oghojafor, Kuye, and Alaneme (2012) Okeudo (2013). Such studies as and Abdou and Moshiri (2009), Al-Obaidan (2002), Cook and Uchida (2003), and Filipovic (2005) that investigated the

macroeconomic economic impact of privatization, all used privatization proceeds, growth in GDP, growth in GDP per capita, and a host of other macroeconomic indicators in their analysis.

Synthesis of Studies Related to the Research Questions

The focus of the key research question is to determine the effect of port concession on economic growth. There are quite some empirical studies on cross-country growth comparison that offer support to the merits of the privatization policy on economic growth as suggested by theory (Parker, 1999, cited by Cook & Uchida, 2003). However, results of empirical studies have been far from conclusive on the subject (Abdou & Moshiri, 2009; Al-Obaidan, 2002, Cook & Uchida, 2003; Filipovic, 2005). Megginson and Netter (2001) attributed the divergence in the results to the very short period covered by most studies, the different research strategies, and methodologies employed, data availability and consistency, sample bias, and validity difficulties (Megginson & Netter, 2001). Most of these cross-country studies that focused on the efficiency effects of privatization at the level of the individual privatized firms concluded that the policy does have positive effects on the economy.

Summary and Conclusions

Major Themes in the Literature

The source of economic growth is still a subject of controversy, and the debate is still raging. At different times since World War II, different growth theories have influenced economic policymaking in most countries of the world, the US inclusive. Until the growth of China and the South Asia region forced a recent rethink on the determinants of economic growth, the prescriptions of the neoliberal growth theory or Washington Consensus held sway in most

countries of the world, most especially in the developing countries. Privatization, together with trade liberalization and deregulation formed the key policy prescriptions of the neoliberal growth theory. The theoretical foundation for privatization rests on the premise that the transfer of property rights from the state to the private sector will incentivize the latter into making the additional investment towards productive efficiency improvements. However, results of empirical studies have been far from conclusive on the subject. Growth theories do not provide any guidance on the variables to include in any growth study.

The Known and the Unknown about Privatization Effects

Given that it is over thirty-five years since countries started implementing the privatization policy in the hope of enhancing their economic growth, quite some literature now exists on the subject. However, a significant number of these studies focused on the microeconomic impact of privatization, extolling the profitability and efficiency gains of privatization, together with improvement in corporate governance at the level of the firm (Boubakri et al., 2009).

There has been very limited literature on the effects of privatization on the overall economic growth of countries that implemented the policy. Although scant literature now exists on the effects of privatization on growth and development, the multiplicity of analytical methods, sample size and period covered, created validity issues and resulted in conflicting results (Megginson & Netter, 2001). However, there appear to be some agreement among scholars that privatization has an important role to play in stimulating the economic, particularly in countries with very strong market institution and protection of property rights. Even in countries with

poorly developed market institutions, privatization played a catalytic role in economic development (Al-Obaidan, 2002). The proviso here is that the implementing governments must complement the privatization program with other reforms measures such as trade liberalization and deregulation. Developing countries, which were consistent with creating strong market institutions while implementing privatization, experience significant growth (Barnett, 2000, Cook & Uchida, 2003; Filipovic, 2005; Plane, 1997). What was not very clear from the studies was the sustainability of the gains of privatization long after the implementation of the privatization program. Literature is not well endowed with research in this area (Plane, 1997).

Another area where there appears to be a substantial gap in the literature is on the distributional effect of privatization. There is currently very little literature on the effects of privatization of the distribution of wealth and employment in countries that have successfully implemented the privatization program (Birdsall & Nellis, 2003; Birdsall & Nellis, 2005). While empirical results reveal that such institutional reforms as trade liberalization and sector deregulation had a catalytic effect on the privatization program, there is scant literature to show the extent, nature or direction of this relationship (Filipovic, 2005). Additionally, Megginson and Netter (2001) noted the presence of strong independent regulation in most of the success stories on privatization, but there is little or no comparative study to determine the exact effect of independent regulation on the attainment of the privatization objectives or the sustenance of privatization outcomes. There has also not been any comparative analysis of port terminals to isolate the real success factors in port privatization (Oghojafor et al., 2012). This study focused

on the impact of the policy at the microeconomic level and later makes the link with economic growth at the macroeconomic level.

How the Present Study Fills at Least One of the Gaps in the Literature

This review of the literature on the phenomenon of privatization indicates that there have been very limited studies on the impact of privatization on the economies of developing countries (Al-Obaidan, 2002). Given this fact, there are some possible outcomes from this study. First, the study will permit policymakers in Nigeria and elsewhere to determine the level of confidence they would place on the privatization program as a panacea for economic restructuring and growth. Second, the study will also enable the policymakers in Nigerian and critical stakeholders to determine the extent to which the privatization of ports has met the specific objectives of the privatization exercise. These objectives include the improvement of the overall operational efficiency and competitiveness of the ports by reducing the ship waiting time, ship turnaround time, and the cargo handling charges. It also includes increasing berth occupancy, reducing and ultimately eliminating the dependence of the ports on the treasury for operations (Filipovic, 2005). Third, the study will additionally enable the World Bank, and other development partners to evaluate the efficacy of privatization as a strategy for promoting economic growth, particularly in developing countries (Nellis, 2003). Fourth, where privatization has not resulted in the expected outcomes, the study has the potential for providing support either for the privatization and other SAP initiatives or inducing a shift in the legislative policy as it relates to these programs (Bernerth, 2004). The last possible outcome of the study will be to

serve as a comparative analysis of port terminals with the intention of isolating the real success factors in port privatization.

Connecting the Gap in the Literature to the Methods

Although growth theories do not provide any guidance on the variables to include in any growth study, empirical studies on growth have used the Cobb-Douglas function, the Solow-Swan models or variants to study the effect size, and direction of the relationships. Those studies that focused specifically on the efficiency impact of privatization on seaports used the SPF, the DEA or the Malmquist Model to establish the relationship between privatization and productive efficiency changes at the ports. The study explored these models in more details in Chapter 3 with the intention of determining the model or combination of models, designs and the methodologies that would best provide answers to the research questions.

Chapter 3: Research Method

Introduction

Purpose of the Study

Since the early 1980s, the Nigerian economy has been undergoing a series of structural economic reforms aimed at repositioning the country for better economic performance. The privatization policy has been among the strategies deployed by the government in this regard. The government has since privatized 167 SOEs, including 24 ports. The privatization of the ports in Nigeria was unique in the sense that it involved virtually all of the key ports in the whole maritime sector. It therefore presents an opportunity to evaluate the impact of privatization on the economy using complete sector data. The objective of this quantitative study was to examine the empirical relationship between privatization and economic growth, using efficiency and productivity data from the privatization of Nigerian ports. Thus, the study tested the proposition that the transfer of property rights by state actors to the private sector provided incentives for the latter to make additional investment toward improved productivity efficiency.

The first task of the study was to establish whether the productivity efficiency changes at the ports following privatization have affected port performance indicators. In undertaking this task, I first determined whether the privatization of the seaports had incentivized investors to make further investments toward improving productivity efficiency. Next, I examined the effect size and direction of the changes in the productivity efficiency of the ports, together with other key port performance indicators. The second task was to determine the extent to which the ports privatization has affected long-term economic growth in Nigeria.

Chapter 3 presents the research method for this study. The chapter consists of five sections, including the introduction. Other sections address the research design, rationale for its selection, methodology of the research, and threats to the validity of the study. The last section summarizes the propositions in the chapter. The chapter commences with a restatement of the purpose of the study. The next section presents the research variables, identifies the research design, and connects the design with the research questions. Additionally, the section contains a discussion of the time and resource constraints inherent in the design choice and the consistency of the choice of design with the advancement of knowledge in the discipline.

In the third section, I discuss the methodology of the study, including the identification of the population, size, sampling procedures, and justification of the sampling strategy. The section also addresses the minimum effect size, number of independent variables in the model, alpha level, power level, and computation of the sample size. This section additionally presents the procedures for data gathering. As the study used historical and secondary data in its analysis, the section also describes the sources of data and their reliability. The section also provides a contextual definition for each of the variables in the study, their appropriate measurement, how to calculate the variables, and what the scores represent. This section on methodology also describes the data analysis plan, identifying the software used for analyses, data cleaning methods and procedures, and a detailed description of the plan for data analysis.

In the next section, I discuss threats to both internal and external validity, including the threat to statistical conclusion validity. The section also covers the ethical implications of the study, with a description of the procedures for mitigating them. The description includes the

agreements for gaining access to data, ethical concerns related to data collection, and the treatment of data. Further, I discuss other ethical issues, including conflict of interest or power differentials. The chapter closes with a summary of design and methodology, as well as transitory material leading to Chapter 4.

Research Design and Rationale

Need for Port Performance Measurement

A seaport is a complex and dynamic system with many moving parts that are constantly interacting with and influencing each other (Esmer, 2008). Efficiency in the utilization of inputs and effectiveness in providing port services to shippers and carriers are key success factors in the industry. Thus, the efficient performance of the ports is an existential reality. For these and other reasons, port managers need to know how effective and efficient their operations are, as well as how the present performance compares with the past, the optimum, the competition, and industrial standards (Esmer, 2008; Talley, 2006). Port managers also need to know whether the port is meeting its economic objectives and targets, whether there is a need for adjustment to meet standards, and how competitive the port is regarding port-time-related and logistics costs (Talley, 2006).

Measurement of Port Efficiency

The appropriate approach for evaluating portsô performance depends on whether the evaluation is about a single port or multiple ports. Regarding a single port, the traditional approach to evaluation is through the engineering single-port methodology (Talley, 2006). The traditional approach compares the actual throughput of the port with the maximum throughput

the port can physically handle or optimum throughput. The performance of a port has improved when its actual throughput tends toward the optimum throughput over time. On the other hand, the portôs performance has deteriorated when the performance of the ports moves away from the optimum throughput. Talley (2006) referred to that level of throughput that meets the economic objective of the port as the optimum throughput. According to Talley, the measures of the economic objective of a port are:

(a) the ñtechnically efficient optimum throughputò;

(b) the ñcost efficient optimum throughputò; or

(c) the ñeffectiveness optimum throughputò (p. 514)

Thus, it is possible to evaluate a port based on technical efficiency, cost efficiency, or effectiveness through a comparison of the actual throughput with each of the above optimum throughput measures.

A direct comparison of a portôs actual performance indicators to standard provides an additional method of port evaluation under the single-port approach (Talley, 2006). Those variables that are internal to the ports and within the control of the portôs management constitute the portôs actual performance indicators. The standard port indicators reflect the economic objectives of the port and may be technically ñefficient standards, cost-efficient standards or effectiveness standardsò (Talley, 2006, p. 514). Upon comparison of actual indicators to standards, positive deviations reflect improvements in performance while negative deviations indicate deterioration. Talley (2006) suggested the comparison of performance indicators with previous years when a port does not have an economic objective or the objective is unknown.

Oghojafor et al. (2012) and Okeudo (2013) used the single-port indicators in their assessment of the postprivatization performance of the Nigerian ports. The single-port performance indicators in this regard include berth occupancy, berth capacity, ship waiting time, ship turnaround time, and port handling charges.

The evaluation of multiport performance becomes more complex due to the multifaceted nature of the business of the ports. This complexity makes a direct comparison among apparently homogeneous ports seem difficult. According to Talley (2006), each port differs from others regarding location, policy, service, operational, and intermodal characteristics and variables that have a significant influence on the result of the comparison. For instance, the key inputs in a typical port range from ñnumber of berth, maximum draught, storage space (in square meters), quay transfer equipment (Gantry cranes, mobile cranes and or floating cranes), yard equipment (straddle carriers, rail mounted gantries, forklifts, reach stackers, trailers) to rail infrastructure, where they existò (Quansah, 2014, p. 37). In the same vein, the output could be break bulk or general cargo, unitized cargo (containerized cargo), liquid bulk, or dry bulk for ore, grains, fertilizer and cement (United Nations Conference on Trade and Development, 1971). Each of these cargo types has different methods for handling cargo.

Despite the differences in the characteristics of individual ports, it is still possible to assess technical and allocative efficiency relative to the levels of input used and output obtained. Such an assessment requires more complex but holistic approaches. Examples of such approaches are the DEA and SFA (Culliane et al., 2004; Sanches et al., 2002, as cited in Esmer, 2008). The literature indicates reliance on frontier statistical models when evaluating the

technical efficiency of multiple port systems. The model utilizes the output and inputs of the group of ports to assess their technical efficiency. Frontier statistical models assess whether the throughputs of the ports are the maximum possible given the level of inputs. When the throughput lies below the production frontier, the throughputs are less than their maximum output, given the level of resources utilized (Talley, 2006). Green (1997, as cited in Porcelli, 2009) described SFA as "an extension of the familiar regression model based on the microeconomic premise that a production function represents some ideal, the maximum output attainable given a set of inputs" (p. 16). Studies, including Cullinane et al. (2006), Estache, González, and Trujillo (2002), Hung, Lu (2010), Tongzon and Heng (2005), and have used the SFA or variants in their designs. The DEA also optimizes output based on a given set of inputs (Cullinane & Wang, 2006, as cited in Hung et al., 2010). Whereas the SFA requires large samples in its analysis, the DEA supports both large and small samples and is more popular with empirics of efficiency gains in specialized containerized ports (Kessy, 2008).

Measurement of Port Productivity

In the literature, there are some mathematical equations or functions that relate the physical output of a production process (goods and services) to the physical inputs. It is the mathematical representation of the relationship between the inputs of a production process such as labor, human and physical capital, and the output of goods and services. The production process could be in a firm, industry, or economy (Bang-Yen, 2011). The production function represents the maximum technologically possible output from a set of production inputs. At the ports, for instance, the production function will be representing the relationship between physical

inputs such as number of berths, maximum draft, storage space, quay transfer equipment, yard equipment and rail infrastructure, and cargo throughput. The output of the production process in relation to the economy is the GDP or GDP per capita. The presupposition of a production function is fundamental to all economic theories at the macro and microeconomic levels. It is a key concept in neoclassical economic theories (Bang-Yen, 2011).

Bang-Yen (2011) identified the h-homogeneous production function class from among the numerous classes of production functions in the literature of particular importance. The h-homogenous production functions include the generalized Cobb-Douglas production function and the normalized constant elasticity of substitution (CES) production function. The major advantage of the Cobb-Douglas production function is its simplicity and convenience. For this reason, it is widely used in the field of econometrics and easily amenable to time series and cross-section analysis. It is possible to generalize the function in the case of ónô factors of production, and it is easy to compute the unknown parameters. It is possible to use the logarithm to convert a linear function through. Further, the function fits the nature of virtually all industries.

Cobb-Douglas Production Function

The Cobb-Douglas production function is a mathematical representation of the relationship between the inputs and outputs of a production process.

The function is given by the following:

P (L, K) = bLŭKɓ

where:

P = total production - given by the monetary values of all output in a year;

L = labor;

K = capital;

P = total productivity factor;

The output elasticities of labor and capital are respectively ŭand ɓ, where ŭ> 0, ɓ > 0

The parameters ŭand ɓ measure the responsiveness of output to changes in the levels of labor and capital. The marginal products of labor and capital are the functions of the parameters A, ŭ, and ɓ and the ratios of labor and capital inputs. That is,

MPL =ÖQ/ÖL = ŭAL ŭ-1K ɓ

MPK = ÖQ/ÖK = ɓAL ŭK ɓ-1

The two parameters ŭand ɓ together measure the degree of the homogeneity of the function such that

ŭ+ ɓ >1: Increasing returns to scale

ŭ+ ɓ =1: Constant returns to scale

ŭ+ɓ <1: Decreasing returns to scale.

The general form of the Cobb-Douglas function is multiplicative and nonlinear. However, the logarithmic form of the function transforms the function into a linear function:

log Q = log P + a log L + ɓ log K

The log-linear form of the Cobb-Douglas function provides an easier expression for computational purposes.

The basic characteristics of the Cobb-Douglas production function are the assumption of constant returns to scale, the unity of the elasticity of substitution, and the unknown parameters ñaò and ñb,ò which represent the proportions of labor and capital, respectively, in the output. Additionally, the marginal product of labor equals the increase in output per increase in the labor input by one unit. Also, the e average product of labor is equal to the ratio between output and labor input. Last, the ratio Ŭ⁄b measures factor intensity. The higher this ratio, the more labor intensive the technique is, and the lower this ratio, and the more capital intensive the technique of production is.

Despite its usefulness, the Cobb-Douglas production function has a number of limitations. First, the generalized function includes only two factors while neglecting other inputs. Although it is possible to extend the model to include more than two factors in the modified model, such inclusion violates the assumption of the constant returns to scale. Second, the assumption of constant returns to scale flies in the face of empirical evidence to the contrary (Bang-Yin, 2011). Third, the measurement of capital in a Cobb-Douglas production function only takes the quantity of capital available for production into account. Fifth, the perfect competition assumption by the function is somewhat unrealistic. Sixth, while the model is simple to apply, it may not reflect the reality in all industries. Seventh, the function does not take the complementarity of factors into account in its analysis while recognizing the substitutability of

factors. Due to these limitations, the function may not provide proper and correct economic implications.

Research Design

This study examined the empirical relationship between privatization and economic growth, using longitudinal data from the privatization of Nigerian ports. The design for the study was the correlational or ex post facto design.

There were two stages in this study. At the first stage, the study measured the impact of postprivatization investments on the productive efficiency of the ports. The study used the DEA is to construct the productive efficiency of ports before and after the privatization exercise. The second stage of the study established the nature and extent of the relationship between the logistics improvement at the ports consequent upon the privatization and economic growth in Nigeria.

In their study of the effects of the improvement of port logistics on economic growth in the Zhejiang Province in China, Huang and Peng (2014) deployed Grey correlation analysis and the DEA approach. Tian and Zhou (2008) used a slightly different approach to their study of the impact of the financial sector on Chinese regional economic growth. In their approach, Tian and Zhou (2008) first used the parametric SPF to estimate the technical efficiency of the banks. After that, the researchers incorporated this technical efficiency score into a growth regression equation (Mankiw et al., 1992) to determine the impact of the banking sector on economic growth (Tian & Zhou, 2008). The underlying proposition of their study was that ñfor a given credit size, varied efficiency of the banking system may lead to varied contributions to economic

growthò (p. 42). In the same vein, Kessy (2008) used the Charnes, Cooper, and Rhodes (1978) variant of the DEA model or CCR to estimate the bank efficiency coefficient, and subsequently integrated the score into the Cobb-Douglas type growth regression equation. Tongzon and Heng (2005), Cullinane et al. (2005), Hung et al. (2010), and Wu and Goh (2010) equally used the DEA to estimate the efficiency coefficient of ports.

In the tradition of Kessy (2008), the study used the nonparametric productivity frontier analysis (DEA) to construct the productive efficiency index for the port sector after the privatization exercise. The productive efficiency index scores also served as input into Cobb-Douglas type growth equation to determine the relationship between the port sector and economic growth.

Data Envelopment Analysis

The DEA ñis a modern approach that can help to provide meaningful answers to these questions by taking into account the actual inputs and outputs used to define the multiple performance indicatorsò (Harrison, 2010, p. 3). It is a technique for ñevaluating the technical efficiencies of a collection of decision-making units (DMUs)" (Harrison, 2010, p. 3). DEA allows the determination of how well a DMU is doing by comparing production, cost, and revenue, and profit data of DMUs against a best possible production attainable, given the inputs deployed. Rather than using the traditional regression analysis to establish an average relationship between the variables of interest in the study, the approach uses the linear programming technique methods to develop a nonparametric frontier over the data. First, the technique identifies the set of best practice observations for which no other firm can produce as

much or more of every output given the inputs. The method then calculates the efficiency measures relative to this surface (Kessy, 2008). According to Charnes, Cooper and Rhodes (1978) cited in Harrison (2010), DMU is 100% efficient if it cannot increase its output by increasing or decrease one or more inputs; and decrease its output by increasing or decrease one or more inputs.

The two most frequently used versions of DEA model are the CCR-model and the BCC-model. Whereas the CCR derived its name from Charnes, Cooper, Rhodes (1978), the BCC originated from Banker, Charnes, and Cooper (1984). The CCR model differs from the BCC model in their treatment of ñreturns to scaleò (Kessy, 2008, pp. 17-18). Whereas the BCC allows for variable returns to scale, the CCR assumes constant returns to scale for each DMU.

The CCR Model of DEA

According to the measure of efficiency introduced by Charnes et al. (1978), the efficiency of each DMU is a function of the weights of the input-output combination. Formally, the efficiency measure for DMU (port) can be calculated by solving the following mathematical programming problem:

$$\text{Maximize } h_0(u, v) = \frac{\sum_{r=1}^{s} u_r y_r^0}{\sum_{i=1}^{m} v_i x_i^0} \quad (1)$$

Subject to

$$\frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 1, j = 1,2\ldots\ldots, n \quad (2)$$

$$u_r \geq 0, r = 1,2,\ldots, s \quad (3)$$

$$v_i \geq 0, I = 1,2,\ldots, s \qquad (4)$$

Where:

x_{ij} = the observed amount of input of the i_{th} type of the j_{th} DMU ($x_{ij} > 0$, i=1,2,……, m, j = 1,2……, n).

y_{ij} = the observed amount of output of the r_{th} type of the j_{th} DMU ($y_{rj} > 0$, r=1,2,……, s, j = 1,2……, n).

u_r and v_i = linear programming determined weights

The dual for the linear programming problem is as follows:

$$\text{Min } z_0 = \theta_0 \qquad (5)$$

Subject to:

$$\sum_{j=1}^{n} \lambda j x_{ij} \geq y_{r0}, r = 1,2,\ldots,s \qquad (6)$$

$$\theta_0 x_i^0 - \sum_{j=1}^{n} \lambda j x_{ij} \geq y_{r0}, i = 1,2,\ldots,m \qquad (7)$$

$$\lambda \geq 0, j = 1,2,\ldots,n \qquad (8)$$

The study expects the solving of the linear programming problems to yield the optimal solution d*, the efficiency score of each port.

The Malmquist Factor Productivity Index

This study used panel data on the efficiency and productivity from the privatization of Nigerian ports from 2007 to 20014. The use of panel data enabled the study to observe a cross section of data over time, thereby allowing for both a dynamic as well as the cross-sectional analysis of the problem (Frees, 2004). The Malmquist TPF Index is one of the DEA techniques that lend itself to panel data analysis. A productivity efficiency assessment using the Malmquist TPF technique identifies the set of best practice observations for which no other firm can

produce as much or more of every output given the inputs. The Malmquist TFP index measures the total productivity changes at the ports, and to decompose the productivity changes into efficiency change, technical efficiency change, pure technical efficiency change, scale efficiency change, and total factor productivity change. It shows the frontier that limits a firm's productive potential, and beyond which a business unit is incapable or producing, given the state of current technology in a given period.

When a firm or industry experiences technical change, there is a shift in productivity towards the frontier. A firm or industry has undergone a technological change when the boundary of production shifts away from the state of current technology in a given period. Technological change, therefore, signifies improvements in efficiency arising from changes in existing technology (Avkiran, 2006, Díaz-Hernández, Martínez-Budría, & Jara-Díaz, 2008). In a Malmquist analysis, a firm is experiencing improvement in productivity or efficiency or both wherever the Malmquist TFP or any of its decomposed components is greater than unity. The DMUs or the entire port complex have experienced no improvement where the TFP values equal unity. A firm or industry is going through a regression in productivity or efficiency or both wherever the Malmquist TFP or any of its decomposed components is less than unity.

Study Variables

Port Input and Output

To measure port efficiency, it is necessary to identify the input and output of the maritime sector. Despite the numerous studies on the benefits of modernizing logistics in the port subsector, there is very little agreement on what constitutes the inputs and outputs of the

subsector. Regarding the output variable, Cullinane and Wang (2006) advised that researchers should restrict their choice of the output variables to those variables that most reflect the productive objectives of the DMUs. Where the productive object of a port (DMU) is to maximize cargo throughput, it is likely to utilize state-of-the-art and expensive equipment as inputs to improve productivity. However, where the objective is to maximize profit, then the port will be more willing to deploy cheaper equipment. In the former case, the output of the port will be cargo throughput whereas in the latter case, the objective will be profits (Cullinane et al., 2005). In their empirical examination of the relationship between privatization and relative efficiency within the container port industry, Cullinane et al. (2005) assumed that the main objective of the port is to minimize input and maximize output. This objective is achievable when the port uses its labor, land and equipment in an efficient manner. For this reason, Cullinane et al. used cargo throughput as output and a long list of variables as possible input. These variables include total quay length, the terminal area, number of gantry cranes, the number of yard gantry cranes, and the number of straddle carriers as the most suitable inputs.

Chiang (1998) used the total tonnage handled by the ports as output and some measures of port infrastructure and labor as inputs. The infrastructure-related measures are the real value of the net assets at the ports; and the average number of employees per month in a year. The former measure is the proxy for technological improvement. The measure for labor is the number of laborers used during the year. In their study, Cullinane et al. (2006) used cargo throughput as the output variable. The input variables used by Cullinane et al. (2006) are the terminal area in hectares; and the number of cargo handling equipment. These input variables are the proxies for

all the other equipment at the ports. Unlike Chiang (1998), who included the number of laborers engaged by the ports in a year, labor did not form part of the input variables in Cullinane et al. (2006). The assumption that underlines this choice of input variables by Cullinane et al. (2006) is that there is a fixed relationship between labor and equipment at the ports. Turner, Windle, and Dresner (2004) used the same approach in their analysis of the productivity of North American ports using the DEA approach. They supported the idea of a fixed relationship between labor and equipment at the ports. A number of other studies also made the same assumption and restricted their choice of input variables to the physical measures of port infrastructure, and outputs to those produced by that infrastructure (Cullinane et al., 2006; González & Trujillo, 2008; Tongzon, 1995).

This study followed the tradition established by Cullinane and Song (2006), González and Trujillo (2008), and Tongzon (1995) in choosing of the input and output variables that are relevant to the study. In line with the objectives of the ports privatization, the study first assumed that the productive objectives of the privatized Nigerian ports are the maximization of output and the minimization of inputs. The choice of output following the output maximization objective was cargo throughput while the factor input in ports operations are quay length, terminal area, and the number of pieces of cargo handling equipment. In the light of these considerations, the study used the following DEA model specification:

$$\text{Maximize } d' = \frac{U_1 \text{ Cargo Throughput}i}{V_1\text{Quay length}i + V_2\text{Terminal}i \text{ area} + V_3\text{Equipment}i} \quad (9)$$

Subject to:

$$\frac{DMU_1 \quad U_1 \text{ Cargo Throughput}_1}{\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad} \text{ Ò}1$$

$$\frac{V_1\text{Quay Length}_1 + V_2\text{Terminal Area}_1 + V_3\text{Equipment}_1}{\text{DMU}_2 \qquad U_1\text{ Cargo Throughput}_2} \quad \text{Ò}1$$

$$\frac{V_1\text{Quay Length}_2 + V_2\text{Terminal Area}_2 + V_3\text{Equipment}_2}{\text{DMUn} \qquad U_1\text{ Cargo Throughput}_n} \quad \text{Ò}1$$

$$V_1\text{Quay Length}_N + V_2\text{Terminal Area}_N + V_3\text{Equipment}_N$$

Where:

Cargo Throughput is sum of inwards and outwards cargo handled by the port in a year;

Quay Length is the length of the quay at the port;

Terminal Area is the terminal area in hectares;

Equipment is the number of pieces of cargo handling equipment

$\mathbf{U_i}$ is the weight attached to the ith output;

$\mathbf{V_i}$ is the weight attached to the ith input; and

N is the number of DMUs.

The objective function = Maximize the efficiency scores Ū for the DMU*i*, subject to the constraint that when the same set of *u* and *v* weights is applied to all other DMUs being compared, no DMU will be more than 100%efficient.

Modeling Port Efficiency and Economic Growth

The conventional Cobb-Douglas neoclassical one-sector function provides the basis for analyzing the impact of the privatization of the ports and accompanying efficiency on the Nigerian economy (Kessy, 2008). In his analysis of estimation of the relative efficiency of European container ports using the SPF approach, Cullinan and Song (2006), suggested the use

of the log-linear Cobb-Douglas function as an appropriate structure for the model. Tian and Zhou (2008) also used a typical neoclassical growth function to establish a causal relationship between the banking system efficiency and Chinese regional economic growth. Their growth function included the inefficiency score of each bank in the banking sector.

Although it was originally put forward by Odedokun (1996) with a view to determining the impact of the banking sector on the economy, this study adapted the framework for analyzing the role of the port subsector in economic growth. In its simplest form:

$$Yt = f(Lt, Kt, Ft, Zt) \quad (10)$$

Where

Y = Aggregate output or real GDP

L = Labor force

K = Capital stock

F = Measure of level of financial sector development

Z = Vector of other factors that are inputs in the aggregate production process.

This study substituted the variable ñFò with ñPò in the function to reflect the level of development at the ports. Kessy (2008) opined that best measure for assessing a sectorôs contribution to economic growth is the efficiency with which the sector promotes economic growth. Following this argument, this study used the port efficiency to determine the contribution of the port sector to economic growth. In that case, the variable P will be a composite of both qualitative and quantitative components of the port subsector, given by:

$$P = \frac{C}{(1+i)^{\partial}} \quad (11)$$

Where C is the cargo throughput of all the ports in a year, *i* is the measure of portôs inefficiency, and ∂ is the weight of the inefficiency in the allocative process.

The variable Z in this study comprised the proxy for ñease of doing businessò together with other institutional factors. These institutional factors include the proxies for deregulation, trade openness, corruption, and other macroeconomic indices.

Assuming a Cobb-Douglas type production function, the resulting function is:

$$Y_t = e^{\beta 0} K_t^{\beta 1} L_t^{\beta 2} P_t^{\beta}{}_3 Z_t^{\beta 4} \quad (12)$$

A natural log of both sides of the equation will produce:

$$LnY_t = \beta_0 + \beta_1 K_t + \beta_2 L_t + \beta_3 P_t + \beta_4 Z_t \quad (13)$$

Substituting P in *Equation 11* in *Equation 13*, we have

$$\beta_3 LnP = B_3 Ln \frac{C}{x (1+i)^{\lambda}} = LnC - \psi Ln\,(1-i) \quad (14)$$

Where $\beta_5 = \theta\lambda$

Substituting (14) in (13) produces:

$$\text{LnY} = \beta_0 + \beta_1 \text{LnK} + \beta_2 \text{LnL} + \beta_3 \text{LnC} - \beta_5 \text{Ln}\,(1-\text{i}) + \beta_4 \text{LnZ} \quad (15)$$

Using lower case to denote the log of the variables for the sake of simplicity produces:

$$\text{y} = \beta_0 + \beta_1 \text{k} + \beta_2 \text{l} + \beta_3 \text{c ï } \beta_5 \text{ln}\,(1-\text{i}) + \beta_4 z \quad (16)$$

The implication of *Equation 16* is that there are two ways that development in the port subsector could affect economic growth. The first involves an increase in the cargo volumes while the second implies a decrease in inefficiency (1-*i*). The coefficient β_3 will be greater than zero where the mechanism of transmission of growth is through increases in the cargo volumes. On the other hand, where the mechanism of transmission is through a reduction of inefficiency at

the ports, the coefficient β_5 will be greater than zero. Where both coefficients are greater than zero, it will mean that the port subsector does play a significant role in economic growth.

Introducing the error term (μ_t) yields:

$$y = \beta_0 + \beta_1 k + \beta_2 l + \beta_3 c \text{ ï } \beta_5 \ln (1-i) + \beta_4 z + \mu \quad (17)$$

The variable Z in this study comprised control variables designed to capture general historical events that have the potential of providing alternative explanations for any observed changes in the economy not attributable to the privatization of the ports. In this study, the Z variable includes both macroeconomic variables and institutional variables. While the macroeconomic variables consist of the interest rate, rate of inflation, the rate of population growth and the unemployment rate. The selection of institutional factors present a challenge as there are as many institutional factors that affect growth as there are empirics (Boubakri et al., 2009). Cook and Uchida (2003), in their analysis of the impact of privatization on economic growth across 63 countries, included political stability, inflation, government consumption and public debt as part of the institutional factors. Their study also included liquid liabilities as a proxy for financial sector development, budget deficit or surplus and population. Filipovic (2005) included institutional factors such as the ratio of government consumption to GDP, total savings as a percentage of GDP, gross secondary school enrollment ratio and inflation of consumer prices. Other variables Filipovic included are government budget balance as a percentage of GDP, total national debt as a percentage of GDP, aid for development per capita and privatization proceeds as a percentage of GDP and FDI as a percentage of GDP. Filipovic also used the percentage of individuals who expressed the lack of confidence in courts to uphold

property right and the intensity of local competition. In their analysis of the impact of privatization on capital formation in 105 developing countries, Abdou and Moshiri (2009) used institutional factors such as ratio of investment to GDP, the growth rate of real GDP per capita income, credit to the private sector as a percentage of GDP and the real interest rate, ratio of public investment to GDP, percentage change in GDP deflator, the ratio of external debt service payments to exports of goods and services, the ratio of external debt to GDP, the terms of trade and privatization revenue as a share of GDP.

For purposes of this study, the total efficiency index (EFF) is the average efficiency of the ports constructed with the use of the DEA Malmquist TFP analysis. The institutional factors included deregulation (DEG), trade openness (OPEN) and an index of corruption or the ratio of government consumption to GDP (GOV). They also included such variables as credit to the private sector as a percentage of GDP (CREDIT), and the real interest rate interest rate (INT) and the inflation rate (INF). The proxy for trade liberalization or trade openness is the ratio of exports and imports to GDP (Barro, 2000; Calderón & Servén, 2010). This study used ñdistance to frontier scoreò developed by the World Bank for ranking countries in its ease-of-doing-business index as a proxy for the effects of deregulation (DEG). This index measures the efficiency of regulation in terms of procedures, time, and cost as they affect small and medium-sized enterprises operating in two largest business city of an economy.

Incorporating these control variables in the *Equation 17* for all periods (T) and DMUs (N) returns *Equation 10* as follows:

$$y_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 l_{it} + \beta_3 c_{it} \text{ ï } \beta_5 EFF(1\text{-}i)_{it} + \beta_6 DEG_{it} + \beta_7 OPEN_{it} + \beta_8 GOV_{it} + \beta_9 INT_{it} + \beta_{10} INF_{it} + \beta_{11} CREDIT_{it} + \mu_{it} \quad (18)$$

For i =1é ..N, and t = 1 é . T

Testing the Channel of Transmission

The primary proposition of this study is that the granting of property rights to investors by way of privatization incentivizes the investors into making additional investments in the privatized firms. These investments are necessary to improve productive efficiency at the ports. Regarding the port privatization in Nigeria, these investments were in the areas of facility upgrade, innovation, technology, and management. Due to the structure of the privatization transactions, most of these investments came in the form of FDI, although quite some investment was by local businesses in the local currency. The secondary proposition is that the port privatization has a positive impact on long-term economic growth.

Where the regression results from *Equation 18* support that secondary proposition, it would be necessary to identify the mechanism for transmission. In his study of the impact of the financial sector on economic growth in East Africa, Kessy (2008) tested ñcapital productivityò and ñincreased volume of capitalò or savings as the possible channels for transmission. While capital productivity measures the ability of more efficient banks to deploy available funds to productive uses, saving measures the capacity of the banks to increase investment.

The study will use the Two-Stage Least Squares (2SLS) regression analysis in testing for

the transmission mechanism. The use the 2SLS regression analysis becomes necessary where the possibility exists that the dependent variable's error terms correlate with the independent variables. The following equations depict the expected relationship:

$$EFF_{it} = \beta_0 + \beta_1 PVA_{it} + \beta_2 Credit_{it} + \mu \quad (20)$$

$$CARGO_{it} = \beta_0 + \beta_1 PVA_{it} + \beta_2 GDP_{it} + \beta_3 OPEN_{it} + \beta_4 DEG_{it} + \beta_5 GOV_{it} + \beta_6 INF_{it} + \beta_7 INT_{it} + \beta_7 DEBT_{it} + \beta_8 PVA_{it} + \mu_{it} \quad (21)$$

$$GDP_{it} = \beta_0 + \beta_1 PVA_{it} + \beta_2 CARGO_{it} + \beta_3 OPEN_{it} + \beta_4 DEG_{it} + \beta_5 GOV_{it} + \beta_6 INF_{it} + \beta_7 INT_{it} + \beta_7 DEBT_{it} + \mu_{it} \quad (22)$$

For i =1é ..N, and t = 1 é . T

Where:

EFF = the total efficiency index (EFF) is the average efficiency of the ports constructed with the use of the DEA.

DEG = the institutional factors includes deregulation

OPEN = trade openness as proxy for trade liberalization

GOV = an index of corruption or the ratio of government consumption to GDP

CREDIT = credit to the private sector as a percentage of GDP

INT = the real interest rate interest

INF = the inflation rate

DEBT = total national debt as a percentage of GDP

PVA = Privatization proceeds

Definition of Variables

Privatization variable (PVA). Privatization proceeds are the gross receipts by the privatizing government from the sale of assets less extra-budgetary management expenditure necessary to bring about the sale (Davis, Richardson, Ossowski, Barnett, & others, 2000). In their various studies on the effect of privatization, researchers have used the total privatization proceed received by the divesting governments as a percentage of GDP as a good measure of privatization (Barnett, 2000; Cook and Uchida, 2003). Abdou and Moshiri (2009) and Al-Obaidan (2002), Cook and Uchida (2003), and Filipovic (2005) all used total privatization proceeds in various forms as the proxy for privatization. The argument in support of this procedure is that total privatization proceeds provide an adequate measure of the change from public to private ownership as it captures the level of political commitment by governments towards the privatization policy (Barnett, 2000; Davis, 2007).

However, privatization proceeds are only a fraction of the investment inflows arising from privatization, most of which takes place after the privatization. With the former narrow measure as the proxy for privatization, it is hardly surprising that some of the growth-impact studies such as Cook and Uchida (2003) did not find a significant relationship between privatization and growth. This study used the aggregate privatization investment as a proxy for privatization to capture all inflows brought about by the privatization of the ports. This definition captures not only the net proceeds of privatization received by the government, but also the postprivatization investments by the concessionaire in the form of facility renovation and upgrade, technology, innovation, management, and manpower. However, it is noteworthy that

the postprivatization inflow of investment for facility upgrade, technology, innovation, management, and manpower is part of the FDI of a country.

Labor (L). There are two possible measures for a countryôs labor force. The first is the annual growth of the population as a proxy for labor. The second is gross secondary school enrollment as a percentage of the population.

Capital (C). The proxy for capital is the gross capital formation in the economy.

Credit (Credit). The availability of credit in the economy is a key determinant of private sector investment (Kessy, 2008). In this study, the proxy for Credit is the availability of credit to the private sector as a percentage of GDP.

Average productive efficiency score (EFF). The EFF is the score constructed using the DEA Malmquist Total Factor Productivity (TFP) model shown in *Equation 9* above.

Inflation (INF). The Concise Encyclopedia of Economics defined inflations as an ongoing rise in the general price level. Fischer (1993) indicated that inflation serves as ñan indicator of the overall ability of the government to manage the economyò. This study is including the inflation variable for that reason. Economic theories also regard inflation as a GDP deflator, indicating that the variable suggest a negative relation between macroeconomic stability and inflation (Bruno & Easterly, 1998; Fischer, 1993).

Government expenditure (GOV). Cook and Uchida (2003) and Filipovic (2005) used government expenditure as an indication of political corruption and bad government. Privatization is part of the measures put forward by the neoliberal school to reduce the influence of the state in economic policymaking. The underlying argument is that when policymaking rests

with organizations whose control is in the hands of politicians, bureaucrats and interest groups, there is a tendency of making allocative decisions based on self-interest only, thereby producing socially undesirable outcomes (Woo-Cumings, 1999). Thus, the increase in government expenditure under the regime of fiscal constraint is a measure of bad government. This study used the ratio of government expenditure to GDP (GOV) to control for bad governance.

Trade openness (OPEN). Privatization, together with trade liberalization and deregulation formed the key policy prescriptions of the neoliberal growth theory. The neoliberalists support wholesale liberalization of the economy in the form of totally unregulated domestic and international markets (Woo-Cumings, 1999). Regarding international trade, the neoliberalists advocated a complete liberalization of external trade in line with the principles of comparative advantage. The neoliberalist also stressed the liberalization of trade, financial markets, FDI and the elimination of barriers to foreign investments (Ezema & Ogujiuba, 2011). The underlying argument in support of openness to international trade is that it stimulates the ñgrowth of exports and increases the availability of imports, thereby accelerating the economyôs technological development and hence fosters economic growthò (Dollar, 1992, cited in Ifionu & Ogbuagu, 2013, p. 27). This study used the sum of exports and imports to GDP as a measure of trade liberalization or openness (OPEN).

Cargo throughput (CARGO). Cargo throughput denotes the total volume inward and outward bound cargo processed or loaded and unloaded at a port location during a period under review (Eniola, Njoku, Oluwatosin, & Okoko, 2014). Statistical records often separate cargo throughput data into import and export. It may also include the quantity of sea-sea transport or

transshipment cargo (World Bank, 2004). In this study, cargo throughput is the output variable in the DEA and the economic growth regression analysis.

External debt (DEBT). External debt is a proxy for country risk. Together with ñease-of-doing-businessò, they represent the ability of the country to attract investment from abroad. In the model, DEBT is the ratio of total external debt to GDP (Ifionu & Ogbuagu, 2013).

Quay length. A quay or wharf is a ñstructure built alongside the water or perpendicular to the shore where ships berth for loading or discharging goodsò (SuPorts, n.d., p. 375).

Terminal area. Enriquez (1991) defined terminals as ña complex of structure, equipment and services, which offers a continuous and flexible response to the servicing demands of certain types of vessel and cargo, permitting the optimum utilization of manpower and equipmentò (p. 1). Based on this definition, an operational terminal area will be the area of land covered by the ñcomplex of structure, equipment and servicesò.

Port equipment. The port equipment is varied and depends on the type of business undertaken at the ports. The types of businesses and cargo types carried by the Nigerian port system includes dry-bulk (wheat), dry-bulk (cement), unitized/container, and break-bulk (general cargo). Others are liquid bulk (oil services), all categories of vehicles and oil services. The port equipment found at the Nigerian ports consists of Quay transfer equipment, yard equipment, and to rail infrastructure, where they exist (Quansah, 2014). The quay transfer equipment includes gantry cranes, mobile cranes and or floating cranes while the yard equipment comprises straddle carriers, rail mounted gantries, forklifts, reach stackers and trailers (Hockney & Whiteneck, 1986; Quansah, 2014).

Research Design and Research Question

Research Design

According to Frankfort-Nachmias and Nachmias (2008), the use of experimental designs in research allows researchers to evaluate how changes in one or more variables in a relationship, influence change in each other. However, the mere association of two variables does not necessarily imply causality (Lord, 1973). A quantitative study must possess the characteristics of comparison, manipulation, control, and generalizability into its design to maintain the highest level of empirical proof and validity (Frankfort-Nachmias & Nachmias, 2008). The characteristic of comparison enables the study to establish covariance between the variables under study. In other words, the changes in the dependent variables must be related to changes in the independent variable. Control ensures that there are no plausible explanations for the changes observed in the dependent variable other than the changes observed in the independent variables. The attribute of manipulation establishes the time order of the relationship while generalization determines the extendibility of research finding.

Unfortunately, not all studies in the social sciences are amenable to the level of proof of validity provided by randomized experiments. Due to the nature and complexity of social phenomena, it may not be possible or practicable to conduct an experiment. For instance, in the study of a particular riot that has already taken place, it will not be possible to select, manipulate and control the associated variables necessary to establish a causal relationship between the variables (Lord, 1973). It may also be unrealistic to control all variable except for the independent variable of interest. It will also not be ethical and may be too costly to crash a plane

in a study of plane crashes, for instance. There are also circumstances where the independent variable lies beyond the researcherôs direct control. According to St. Peirre, Ricciuti and Creps (1998, cited in Shadish, Cook, & Campbell, 2002), over 76% of the research in the social sciences resort to more appropriate but weaker designs for drawing inferences. However, such causal experiments must meet some basic conditions for establishing causal relationships (Shadish et al., 2002). First, the cause must precede the effects. Second, the cause must be covariate with the effects. Third, there is reduced possibility of an alternative explanation of the causal relationship. Thus, it is possible for designs without randomization and control groups to yield strong causal inferences, provided they meet the above conditions. Shadish et al. further offered some suggestions on the strategies to ensure adherence to the principles. The first is to identify and address all plausible threats to internal validity. The second is to ensure the ñprimacy of control by designò (p. 105). The third is to make a complex prediction about a given causal relationship in a manner that eliminates alternative explanations.

In this study, the privatization intervention by the government has already taken place. It was therefore not possible to have pretest scores of the variables or to manipulate the variable during the experiment. The government also privatized all the ports simultaneously making it impracticable to have control groups. Furthermore, it was also not practicable to establish a temporal precedence between causes and effects as the privatization intervention is post ante. Due to these limitations, the approach to the study was nonexperimental and the design was correlational, using statistical controls.

According to Lord (1973), the correlational method of research ñseeks to establish causal relationships between events and circumstancesò. In other words, it finds out the cause of certain occurrences or nonoccurrences. The design achieves this through a comparison of the circumstances associated with observed effects and by noting the factors present in the instances where a given effect occurs and where it does not occur. The design also allows the researcher to examine ñthe effects of a naturalistically-occurring treatment after that treatment has occurred rather than creating the treatment itselfò and ñrelate this after-the-fact treatment to an outcome or dependent measureò (p. 2).

The objective of the ex-post facto design is to discover or establish causal or functional relationships among variables rather than causal relations (Ary, Jacobs, & Razavieh, 1972, cited in Lord, 1993). The logic behind the design is that the ñcauses of a given observed effect may be ascertained by noting elements that are invariably present when the result is present and which is invariably absent when the result is absentò (Sukhia, Metrotra, & Metrotra, 1966, p. 2151, cited in Lord, 1973).

The correlational design is different from experimental designs in some unique ways. First, it does not control the variable factor as with the experimental design. Rather, the design observes the phenomenon under study under normal field conditions and discovers the causes of observed phenomena.

Rationale for Selection

Campbell and Stanley (1963) described the correlational design or ex-post facto design as the minimum reference point for any design for good reasons. Unlike the pure experiment that

involves the comparison and recording of differences and contrasts, the ex-post facto design involves studying one single group after an event has occurred. The pure experiment establishes a causal relationship between variables by using repeated measures or random assignment of participants between groups used for comparison. With ex-post facto or correlational studies, the random assignment of participants and the manipulation of variables are not possible because the events of interest have already taken place or occurred naturally. The design, therefore, lacks the control of the independent variable or variables. As the event of interest has already taken place, it is impossible and impracticable to isolate and control every possible variable that could influence the possible outcomes of the intervention. With the design is also not possible to ascertain that the selected variables for the study are the most relevant variables in the event. It is not possible to determine with any certainty whether the causative factor has been included or even identified, thus exposing the study to the possibility of multiple and even contradictory hypotheses. For that reason, it may not be possible to disconfirm any hypothesis. Furthermore, the characteristics of comparison, manipulation, control, and generalizability that distinguish pure experiments from other are also not present with the design. The researcher cannot manipulate the independent variable or randomize the selection. Besides, attempts by the researcher to match groups of the key variable to eliminate rival hypothesis may lead to a shrinking of the sample, thus jeopardizing the generalizability of the result (Campbell & Stanley, 1963; Lord, 1973). As a result of these limitations, it may not be possible to establish the order of influence between variables even where there is a very strong correlation between the variable. Since the design methods lack random assignment, active manipulation, and rigorous control

over extraneous factors, it is possible for a particular outcome to arise from different causes on different occasions.

Despite these limitations, researchers have been using the ex-post factor design to make important contributions to knowledge and influence on lives. Research with this method has influenced policy formulation, judicial decisions, and actions of private enterprise. A celebrated example of the use of correlational methods is the correlation of smoking habits with lung cancer. Another example is the correlation between exercise and lowered rates of cardiovascular diseases. This finding has stimulated interests in jogging, swimming, and other such physical exercises. There are also recent examples of contributions to knowledge using the design. Fleetwood, Morgan, McFie, and Robinson (2002), and Parrott et al. (2002) used the design while establishing a relationship between ecstasy and memory loss. The design becomes very useful in most studies in psychology, education, and sociology where ethical considerations preclude experimentation with human subjects (Lord, 1973).

Lord summarized the limitation of the correlational design into two main drawbacks, namely-the direction of control and third variable problems. For a researcher to infer a cause-effect relationship in a correlational study, it may be necessary to determine the exact direction of control. For instance, a study may disclose a high correlation between drug use and poor school performance, such that school performance deteriorates as drug use increases. Does such a finding mean that drug use causes poor performance? Could it be possible that the depression caused by poor performance in school induces the increased drug use? With the correlational design, there is the additional third variable problem. In the drug use example under reference,

could it be possible that there is a third factor at play. Could it be possible that ñdysfunctionalityò in the home is responsible for inducing the drug habit in the first instance and is also the cause of the low performance at school?

In the literature, there are some statistical procedures or correlational analyses that provide the techniques for addressing the problems of directionality and third variables. Regarding the problems of directionality, the available tools include the time-lagged correlational design or cross-lagged panel correlation. Concerning the third variable problem, the literature recommends the use of the partial correlation analysis. The other statistical technique available for reducing the third variable problem is matching, where the researcher matches data from participants with the same characteristics of the third variable (Frankfort-Nachmias & Nachmias, 2008).

Time and Resource Constraints Consistent With the Design Choice

The resource constraints for the study are minimal. The study used secondary data in the analysis to assess the impact of the concession of Nigeriaôs ports on efficiency and productivity of the ports, and after that determine the overall impact of privatization on economic growth. These sources are data published routinely for administrative purposes by the NPA; concession agreements between the government and concessionaires; and information received directly from the concessionaires. The software required for analysis is readily available. The software includes the IBM SPSS Statistics for performing multivariate and 2SLQ regression; DEAP 2.1 free software for performing DEA and Malmquist TFP analysis; and the G-Power software for computing sample size is also freely available.

Consistency of Design With Advancement of Knowledge

Based on the sample size revealed by the G-Power software for multiple linear regressions, the optimal sample size for the study is 153 observations. There are only 24 privatized ports (20 DMUs) privatized ports terminal in the population, with observations spread across eight years, resulting in a total of 160 observations. With this sample size, randomization of the sample will no longer be necessary. The primary statistical tools of analysis and control of covariates are the DEA, linear multiple regression, the 2SLS regression, and partial correlation analysis. The study first used the DEA Malmquist TFP to construct the productive efficiency index for the port sector after the privatization exercise. The latter scores served as input into a multivariate growth regression to determine the relationship between the port sector and long-term economic growth (Frankfort-Nachmias & Nachmias, 2008; Kessy, 2008; Laerd Statistics, 2014). The study further used the 2SLS technique to isolate the mechanism through which privatization transmitted economic growth. Last, the study deployed the ñcross-lagged panel correlationò and the partial regression plot to resolve the issues of ñdirection of controlò and ñthird variable problemsò associated with correlational designs.

The central research question in this study is: What is the effect of port concession on economic growth? The first subquestion deriving from the main question is how and to what extent has private investments following the privatization affected the productivity efficiency of the ports after privatization. The second subquestion sought to determine the extent to which the postprivatization productivity efficiency of the ports predicts changes in the GDP per capita? The study utilized the DEA Malmquist TFP to construct the productive efficiency index for the port

sector before and after the privatization exercise. The latter scores served as input into a multivariate growth regression to determine the relationship between the port sector and long-term economic growth.

Methodology (IRB approval number 05-03-16-0337924)

Population or Type of Data

The population of the study is the group of 24 privatized ports in Nigeria. The guiding principle in selecting this population for the study was homogeneity of the population. According to Patton (2002), the population for a study must have some distinguishing feature in common. The first distinguishing feature of the study population is that the 24 privatized ports under study are all operating within the geographical confines of Nigeria. In that case, the ports are subject to identical institutional, legal and regulatory frameworks applicable in Nigeria (NPA, 2014). Third, all the ports are already in operations for a minimum of ten years, postconcession.

Sampling and Sampling Procedures

The study used the entire population of 24 ports as the sample for the study. There are three factors that I took into consideration in choosing the appropriate sample size for the study. These factors are the total of seven predictors, an alpha Ŭ= .05 and a medium effect size of .15. The statistical power is the probability of detecting a real effect of the concession exercise or real relationship between the variables while the alpha (Ŭ) provides a measure of the probability of arriving at a wrong conclusion with the sample size. The effect size measures the strength of the relationship between the research variables (Burkholder, n.d., Rudestam & Newton, 2014). Regarding this study, the effect size is the extent of the relationship between postconcession

investments and efficiency, productivity and economic growth. According to Burkholder, a relatively large sample improves the likelihood of discerning a relationship between the variables where one exists and large values of the alpha of increase the probability of arriving at the right conclusion.

In computing the sample size using the G-Power software, the study assumed a total of seven predictors, an alpha Ŭ= .05 and a medium effect size of .15. A computation of sample size with the G-Power software for multiple linear regressions based on these parameters revealed a sample size of 153 observations. There are only 24 privatized ports (20 DMUs) privatized ports terminal in the population, with observations spread across eight years, resulting in a total of 160 observations. With this sample size, the study has a good chance of detecting any important effects of the privatization exercise.

Data Collection

There were five primary sources of data used in this study. The first consisted of data compiled and published routinely by the NPA. These comprise various issues of the Abstract of Port Statistics, quarterly performance reports on ports operations from all the ports detailing efficiency indicators and investment performance by concessionaires. These data also include the monitoring and compliance reports of the NPA, collected on a terminal-by-terminal basis for various years, showing basic port data, financial obligations, lease fees, throughput, throughput fees, and operational details. The second source of data consisted of concession agreements executed between the government and the concessionaires. These agreements provide fuller details of the rights and obligations of the parties under the concession. They also describe the

agreed-upon postacquisition investment plans of each concessionaire and the expected key performance indicators. The ICRC provided the details of the obligations of the parties to the concessions. As part of its responsibilities, the ICRC maintains custody of these agreements, and ensures compliance with the terms and conditions of the contracts. In addition, the ICRC prepares routine monitoring and compliance reports for periods covered by the concessions. The third source of data was published information available through the websites of the CBN and the NBS. They included annual abstracts and other publications. I used the data from the later sources to augment and authenticate the data obtained from the first and second sources. The fourth source was the publication of the IMFôs Financial Statistics and the World Bank Indicators. The last source was data obtained for the port terminals operatorsô websites. These were supplementary to the data already collected and included data from the websites of concessionaires.

Agreements to Gain Access

There are some concerns relating to the use of archival data. The first relate to the issue of confidentiality. In this regard, the study executed a Data Use Agreement, as well as a Confidentiality Agreement with both the ICRC. There is also the concern regarding the use of certain types of competition-sensitive data that concessionaires provided to the ICRC after the concession exercise. The information in this category includes growth plans, future strategic and investment plans; and such other information that may be useful to the competition. The study addressed this concern by obtaining a letter of cooperation from the concerned concessionaires. It may also be necessary to anonymize the data before use (Law, 2005). Anonymizing the data

involved removing all identifying characteristics and information from the original dataset to preserve confidentiality and privacy. There is also concern regarding the violation of existing property, patent and copyright laws. These rights relate to certain types of proprietary materials such as charts, photographs and the like. The study sought and obtained the participantôs permission for their use. Last, there is the concern for the physical security of sensitive data to theft and other cybercrimes. In this regards, the study used the resources of the internet cloud such as Google Dropbox to archive its resources and data.

Data Analysis Plan

The central research question in this study is as follows: What is the effect of port concession on economic growth? The approach to the study is quantitative, and the design is correlational, with statistical control. The key method for constructing the total factor productivity index of the ports is the DEA Malmquist TFP analysis, which optimizes output at the ports based on a given a set of input. The total productive index formed an input into a Cobb-Douglas type economic growth model. The study will be using the multivariate, and 2SLS regression functions to determine ways that development in the port subsector could affect economic growth and establish the channels for transmission respectively.

Data Cleaning and Screening Procedures

As the study used the multivariate and the 2SLS regression in its analysis, there are certain assumptions that would be necessary to ensure that the results are valid and reliable. First, the dependent variable should be on a continuous scale, implying that the dependent variable is either on an interval or ratio scale. Second, there must be two or more independent variables in

the model, which could be on interval, ratio, ordinal or nominal scales. The study confirmed these two assumptions before proceeding with the multiple regression analysis. There are additional assumptions of independence of residuals, the variances along the line of best fit are approximately similar, the absence of multicollinearity, and the absence of significant outliers in the dataset. Other assumptions include linearity of the relationship between the dependent variable, and each of the independent variables, the collective linearity between the dependent variable and the independent variables, and the residuals (errors) are approximately normally distributed (Laerd Statistics, 2013).

The violation of these assumptions, particularly the presence of significant outlier and multicollinearity, could affect the validity and reliability of the results. It was, therefore, necessary to have a protocol for cleaning out the data before analysis. First, a visual examination of the standardized scores will reveal the records with values more than /3.29/, indicating the existence of significant outliers. Alternatively, the study could use the *Casewise Diagnosis* to reveal any significant outlier as they fall beyond 3 standard deviations from the mean. The study will adjust the outliers to the next significant record. Second, the study conducted a multicollinearity test by performing a linear regression of the independent variable and dependent variables. An alternative test will use the Pearson Correlation to confirm the absence of multicollinearity. A Tolerance/VIF value of less than unity indicates the absence of multicollinearity from the partial regression plot of the independent variables against each other. The third is to perform a Durbin-Watson to confirm the independence of residuals. Fourth, it will be necessary to secure a scatterplot of the standardized residuals against the predicted value

to confirm that the variances along the line of best fit are approximately similar. Fifth, a visual inspection of the normal P-P plot of standardized regression residuals will reveal the existence of linearity in the relationship between the dependent variable and each of your independent variables and the dependent variable and the independent variables collectively. Last, the study will use an inspection of the histogram, which superimposed with a normal P-P plot of standardized regression residuals, to confirm whether the residuals (errors) are approximately normally distributed.

Research Question(s) and Hypotheses

The central research question in this study was the following: What is the effect of port concession on economic growth? The subquestions that derive from the main question above are as follows:

1. What is the effect of the postprivatization investment on productive efficiency of the ports after privatization?
2. To what extent does the postprivatization productive efficiency of the ports predict changes in GDP, GDP growth, GDP per capita, and GDP per capita growth?

The study used the nonparametric DEA Malmquist TFP analysis to construct the total factor productivity efficiency index for the port sector before and after the privatization exercise. The latter scores served as input into a multivariate regression analysis to determine the relationship between the port sector and long-term economic growth.

Null and alternative (research) hypotheses.

Hypothesis 1. The level of investments at the Nigerian ports that accompanied their privatization can accurately predict the portsô efficiency index.

H_o: $б_1 < 1$ (the total factor productivity $б_1 < 1$)

H_1: $б_1 > 1$ (the total factor productivity $б_1 > 1$)

Hypothesis 2. A causal relationship exists between the linear combination of the portsô total efficiency index, institutional factors, trade openness, the index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput and the level of the GDP in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1 Í 0$ (at least one coefficient $б_1 Í 0$)

Hypothesis 3. A linear combination of total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could accurately predict the GDP growth in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1 Í 0$ (at least one coefficient $б_1 Í 0$)

Hypothesis 4. The linear combination of the total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate,

privatization proceeds, and cargo throughput could explain the variations in the level of the GDP per capita in Nigeria.

H_o: $ß_1 = ß_2 = ß_3 = ß_4 = ß_5 = ß_6 = ß_7 = ß_8 = ß_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $ß_1 \neq 0$ (at least one coefficient $ß_1 \neq 0$)

***Hypothesis 5*.** The linear combination of the total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could accurately predict the GDP per capita growth in Nigeria.

H_o: $ß_1 = ß_2 = ß_3 = ß_4 = ß_5 = ß_6 = ß_7 = ß_8 = ß_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $ß_1 \neq 0$ (at least one coefficient $ß_1 \neq 0$)

Where $ß_1$ = total efficiency index; $ß_2$ = institutional factors; $ß_3$ = trade openness; $ß_4$ = index of corruption; $ß_5$ = credit to the private sector; $ß_6$ = real interest rate; $ß_7$ = inflation rate; $ß_8$ = privatization proceeds; and $ß_9$ = cargo throughput.

Choice of Covariate and Confounding Variables

Economic growth theories do not provide much guidance on variables to include in any growth study (Boubakri et al., 2009). Levine and Renelt (1992) cited in Boubakri et al. (1992) found over 50 variables that significantly correlated with growth in a single study. The list includes initial conditions, policy variables, and institutional variables, but most empirical studies include ñinvestment, population growth, initial per capita GDP, and initial human

capitalò. In their study, Cook and Uchida (2003) analyzed the impact of privatization on economic growth across 63 countries for nine years while controlling for alternative explanations the changes ascribed to privatization. Their growth regression included the proxy for trade liberalization (openness), FDI, political stability, inflation, government consumption and public debt. They also included liquid liabilities as a proxy for financial sector development, budget deficit or surplus, GDP growth per capita and population. In a similar study, Filipovic (2005) used per capita growth to regress against the privatization proceeds in 94 countries and arrived at some conclusions. Among the 18 in Filipovic (2005) model are initial GDP per capita growth rate, GDP in the initial year, average population growth rate, the ratio of government consumption to GDP, total savings as a percentage of GDP, gross secondary school enrollment ratio and inflation of consumer prices. Other variables include government budget balance as a percentage of GDP, total national debt as a percentage of GDP, aid for development per capita measured in US Dollar in year and privatization proceeds as a percentage of GDP and FDI as a percentage of GDP, among other.

In the literature, there is empirical evidence that privatization proceeds and postprivatization investment increase FDI and local capital investment. However, some studies also show that changes in the GDP and other aggregate economic indicators do lead to productivity improvements at the ports (Seabrooke et al., 2003). Moreover, the GDP is also dependent on the level of investment, productivity, and efficiency changes brought about through the privatization (Filipovic, 2005). Controlling for the influence of intervening variable is necessary to determine the real effects of changes in productive efficiency at the ports on

economic growth, given the complexity of the reciprocal causation between the variables relevant in ports privatization. That way, it will be possible to isolate the effects that one could attribute to the privatization exercise and those associated with the covariates.

For these reasons and based on the nature of the current study, I restricted the choice of covariates to the proxies for institutional factors, trade openness, an index of corruption or the ratio of government consumption to GDP and the growth rate of real GDP per capita. Other covariates are credit to the private sector as a percentage of GDP and the real interest rate interest rate and the inflation rate. The proxy for trade liberalization or trade openness is the ratio of exports and imports to GDP (Calderón & Servén, 2010; Barro, 2000). This study used the ñdistance to frontier scoreò developed by the World Bank for ranking countries in the ease-of-doing-business index as a proxy for the effects of deregulation. In this study, the ease-of-doing-business index measures the efficiency of regulation regarding procedures, time, and cost as they affect small and medium-sized enterprises operating in the largest business city of an economy-Lagos.

Interpretation of Results

I used the multivariate analysis in determining how postprivatization productivity efficiency of the ports or cargo throughput could accurately predict the growth in GDP, GDP per capita, and GDP per capita growth (Laerd Statistics, 2013). In *Equation 16,* the coefficient ɗ of cargo throughput will be greater than zero where the mechanism of transmission of growth in a privatization exercise is through increases in the cargo volumes. On the other hand, where the mechanism of transmission is through a reduction in inefficiency at the ports, the coefficient ɣ

will be greater than zero. Where both coefficients are greater than zero, it would mean that the postprivatization productivity efficiency of the ports and cargo throughput are significant predictors of economic growth.

I also compared the relative productivity index of each port constructed with DEA-Malmquist TFP analysis after the privatization exercise. Increases in the relative productivity indices of the ports after privatization will indicate privatization-induced improvements. I used the multivariate analysis of growth model in *Equation 18* to test the relationship between postprivatization productivity efficiency or cargo throughput and the growth in GDP, GDP per capita, and GDP per capita growth. The study provided further confirmation of the transmission mechanism by performing the linear multiple regressions of *Equations 20* to *22* above. The study tested for the transmission mechanism using a set of the simultaneous equation derived from the primary and second propositions of the study.

Threats to Validity

Validity relates to the accuracy of the inferences made from test scores (Frankfort-Nachmias & Nachmias, 2008). There are three main methods of obtaining evidence of the validity of a measurement. These are evidence based on content, relationship with other variables and the internal structure of the measurement (ñStandardized Measurement and Assessment,ò n.d.). The reliability of a measurement is necessary for the credibility of test score but not sufficient to confirm validity.

There are certain features of this study that expose it to possible threats to validity. First, the privatization exercise has already taken place, making it impracticable to have a group of

ports to use as the control. Besides, the government privatized all the ports in the maritime industry at the same time. Second, the manipulation of the variables of the study is also not possible, given that the privatization exercise is post ante. Thus, the conduct of pretest before the privatization was not practicable as with true experiments. Due to these feature, the design of the study was correlational design or ex post facto.

With the correlational design studies, the random assignment of participants and the manipulation of variables is not possible because the events of interest have already taken place or occurred naturally. The design, therefore, lacked the control of the independent variable or variables. In the same vein, it is not possible and impracticable to isolate and control every possible variable that could influence the possible outcomes of the intervention. Furthermore, it is also not possible to be certain that the selected variables for the study are the most relevant variables in the event. Additionally, it is not possible to determine with any certainty whether the causative factor has been included or even identified, thus exposing the study to the possibility of multiple and even contradictory hypotheses. For that reason, it may not be possible to disconfirm any hypothesis. Moreover, the characteristics of comparison, manipulation, control, and generalizability that distinguish pure experiments from other are also not present with the design. The researcher cannot manipulate the independent variable or randomize the selection. Besides, attempts by the researcher to match groups of the key variable to eliminate rival hypothesis may lead to a shrinking of the sample, thus jeopardizing the generalizability of the result (Campbell & Stanley, 1963; Lord, 1973). As a result of these limitations, it may not be possible to establish the order of influence between variables even where there is a very strong correlation between

the variable. It is also possible for a particular outcome to arise from different causes on different occasions.

Shadish et al. (2002) provided a recipe for these types of studies. According to Shadish et al. (2002), causal experiments must meet some basic conditions for establishing causality. The cause must precede the effects. Next, the cause must be covariate with the effects. Additionally, there must be a reduced possibility of having an alternative explanation of the causal relationship. It is, therefore, possible for designs that lack random assignment, active manipulation, and rigorous control over extraneous factors to yield strong causal inferences, provided they meet the above conditions. While the correlational design may not have inbuilt design controls, there are some correlational analyses statistical techniques for addressing the dual challenges of directionality and third variables inherent in the design. Regarding the problems of directionality, the available techniques include the time-lagged correlational design or cross-lagged panel correlation. With the third variable problem, the literature recommends the use of the partial correlation analysis. Another statistical technique available for reducing the third variable problem is matching, where the researcher matches data from participants with the same characteristics of the third variable (Frankfort-Nachmias & Nachmias, 2008).

There is a feature of panel data analysis that exposes it to validity threats ï presence of serial correlation or autocorrelation. Serial correlation is present when the empirical values of a predictor variable are stationary over time. In that case, the residuals will not be independent, thus violating a key statistical criterion for the validity of a multiple regression analysis. A preliminary assessment of the independence of the residuals indicated the presence of serial

correlation in the dataset. Liker, Augustyniak, and Duncan (1985) suggested the use of the First Differenced Method among other statistical techniques to correct any serial correlation. The First Differenced Method involves first converting all the variables in the dataset into first differenced data and performing a multiple regression analysis of the differenced dataset without an intercept. The used this method to correct the dataset before the multiple regression analysis is important in order not to impair validity.

IRB Review Requirements

Ethical Concerns

The use of these secondary datasets and archival information posed little risk to the participants who are largely inanimate. According to Law (2005), the major ethical concerns regarding the use of secondary data relate to the issues of privacy and confidentiality. The privacy concerns relate to studies involving purely human subjects, which is absent in the study under consideration. The confidentiality concerns arise when the study uses certain confidential information, which participant provided for purposes other than those of the study. Examples of such information are those provided confidentially to the BPE relating to the concessionaires future strategic and investment plans. In other words, the participants would not ordinarily have provided such information if the original purpose were for this particular research. The second concern relates to the use of photographs, charts and other proprietary materials whose use constitutes a violation of confidentiality. The third concern relates to copyright issues. These three issues create the potential for lawsuits against the researcher, especially when the results of the study affect public perception of the concessionaireôs or governmentôs compliance with the

terms of the concession. The fourth ethical risk relates to the issue of the validity and credibility regarding the use of data whose original purpose of the collection was not for this research. The last is the issue of data security and the threat of security lapses inherent in sharing electronic data.

Agreements to Gain Access

There are some measures suggested by Law (2005) for addressing the types of ethical concerns and risks mentioned above. Regarding concerns about confidentiality, the researcher could execute a Data Use Agreement, as well as a Confidentiality Agreement with both the ICRC and the NPA. The researcher could address the concern regarding the use of certain types of competition-sensitive data provided to the ICRC as custodian of the concession agreement. The information in this category includes growth plans, future strategic and investment plans; and such other information that may be useful to the competition. In this regard, the suggestion by Law (2005) that a proper anonymizing of the data is very apt. Anonymizing the data involved removing all identifying characteristics and information from the original dataset to will help preserve confidentiality and privacy. There are also certain types of proprietary materials such as charts, photographs and the like, whose use may violate existing property, patent and copyright laws. The study additionally sought and obtained the participantôs permission for their use. As secondary datasets and archival data were not specifically designed for this particular research, the data may contain errors and discrepancies. In this regard, study plans to use the triangulation of information to verify the integrity of secondary data. There are other published statistics that the study could use for authentication. These include data from the International Maritime

Organization, World Trade Organization, and Annual Digest of trade and the CBN. Last, there is the issue of physical data security such as cyber theft and other such risks to sensitive data. In this regards, the study already archives its data and resources with Google Dropbox. There have been minimal security breaches with this procedure.

Research Plan to Scale Initial IRB Review

Independent review boards such as the IRB at Walden University ensure that professionals always act ethically with research involving human subjects (Rudestam & Newton, 2014). For instance, the IRB at Walden University ensures that researchers adhere to principles that protect the human participant in research. Such principles include the minimization of the risks of physical injury, psychological discomfort and loss of privacy (Berner, OôSullivan, & Rassel, 2008). Other ethical considerations that minimize the risks to the human subject include the reasonableness of the research, equity in participant selection and reduction of participantôs coercion. IRB requires researchers to make full disclosure of the objectives and the risks associated with the research and ensure that the selection of research participants is equitable. In all research involving human participants, the IRB requires researchers to obtaining informed consent. According to Rudestam and Newton (2014), the treatment of ethical issues in research is a balancing act between the risks associated with a research project and the benefits.

Institutional Permissions

Institutional permissions were requested from the custodians of the five main secondary sources of data. These are the NPA, landlords to the Nigerian ports and routinely publish

quarterly performance reports on ports operations from all the ports; and the ICRC, which maintains custodianship of these agreements.

Summary

The objective of this quantitative study is to examine the empirical relationship between privatization and economic growth, using efficiency and productivity data from the privatization of Nigerian ports. Specifically, the study established how changes in the productivity efficiency at the ports following privatization affected the long-term economic growth of per capita income in Nigeria.

The approach to the study is quantitative and nonexperimental. The design is correlational with correlational and statistical control. The key method for constructing the total productivity index of the ports is the DEA-Malmquist TFP analysis, which optimizes output at the ports based on a given a set of input. The total productive index will form an input into a Cobb-Douglas type economic growth model. The study used the multivariate and Two-Stage Least Square regression functions to confirm the channels for transmission through which the development in the port subsector affect economic growth.

In Chapter 4, the study used the design and methodology presented in this chapter to undertake data collection, collation, and analysis.

Chapter 4: Results

Introduction

Purpose of the Study

The privatization of the 24 seaports in Nigeria, which accompanied a series of structural economic reforms beginning in the early 1980s, had the reduction of allocations from the national budget to the ports for daily operations as its main objective. Other objectives included improving the overall operational efficiency of the ports, making them more competitive, increasing the volume of cargo handled at the ports, and improving cost efficiency. There were additional objectives such as increasing revenue generation for the government, achieving a complete restructuring of the maritime subsector, and deepening the countryôs capital market (Filipovic, 2005; Oghojafor et al., 2012). The privatization of the Nigerian ports involved virtually all of the major ports in the maritime sector. It is one sector of the economy that fully experienced the privatization program. It therefore presents a unique opportunity for researchers who are interested in using efficiency and productivity data from the sector to examine the empirical relationship between the privatization exercise and economic growth.

The first task in this study was to determine whether it is possible to attribute the productivity changes that accompanied the ports privatization to the privatization exercise, as well as to ascertain the nature of the association, its form, and the strength of the relationship. The second task was to establish whether the changes that accompanied the ports privatization can provide an explanation for the variations in the short and long-term economic growth in

Nigeria. This task involved the assessment of the impact of the privatization exercise on the GDP, GDP growth, GDP per capita, and GDP per capita growth in Nigeria.

Research Questions and Hypotheses

With the objective of the study as a frame of reference, the central research question of the study was the following: What is the effect of port concession on economic growth? The subquestions that derived from the main question were as follows:

1. What is the effect of the postprivatization investment on productive efficiency of the ports after privatization?
2. To what extent does the postprivatization productive efficiency of the ports predict changes in GDP, GDP growth, GDP per capita, and GDP per capita growth?

The null and alternative (research) hypotheses arising from the research questions were as follows:

Hypothesis 1. The level of investments at the Nigerian ports that accompanied their privatization can accurately predict the portsô efficiency index.

H_o: $ϐ_1 < 1$ (the total factor productivity $ϐ_1 < 1$)

H_1: $ϐ_1 > 1$ (the total factor productivity $ϐ_1 > 1$)

Hypothesis 2. A causal relationship exists between the linear combination of the portsô total efficiency index, institutional factors, trade openness, the index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput and the level of the GDP in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1 Í 0$ (at least one coefficient $б_1 Í 0$)

Hypothesis 3. A linear combination of total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could accurately predict the GDP growth in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1 Í 0$ (at least one coefficient $б_1 Í 0$)

***Hypothesis 4*.** The linear combination of the total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could explain the variations in the level of the GDP per capita in Nigeria.

H_o: $б_1 = б_2 = б_3 = б_4 = б_5 = б_6 = б_7 = б_8 = б_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $б_1 Í 0$ (at least one coefficient $б_1 Í 0$)

***Hypothesis 5*.** The linear combination of the total efficiency index, institutional factors, trade-openness, index of corruption, credit to the private sector, real interest rate, inflation rate, privatization proceeds, and cargo throughput could accurately predict the GDP per capita growth in Nigeria.

H_o: $ß_1 = ß_2 = ß_3 = ß_4 = ß_5 = ß_6 = ß_7 = ß_8 = ß_9 = 0$ (the coefficient of all the predictor variables is zero)

H_1: $ß_1 \neq 0$ (at least one coefficient $ß_1 \neq 0$)

Where $ß_1$ = total efficiency index; $ß_2$ = institutional factors; $ß_3$ = trade openness; $ß_4$ = index of corruption; $ß_5$ = credit to the private sector; $ß_6$ = real interest rate; $ß_7$ = inflation rate; $ß_8$ = privatization proceeds; and $ß_9$ = cargo throughput.

Organization of Chapter 4

The arrangement of this chapter is in four sections. The introductory section provides a brief review of the purpose of the study, the research questions, and the hypotheses. In the second section, I discuss the methodology of the study. This section describes the time frame for data collection as well as actual recruitment and response rates. Additionally, it presents discrepancies in data collection from the plan presented in Chapter 3 and reports baseline descriptive and demographic characteristics of the sample. In this section, I also assess the representativeness of the sample in relation to the population of interest. The third section presents the results of the study. In this section, I present descriptive statistics that appropriately characterize the sample; evaluate the statistical assumptions as appropriate to the study; and report on the statistical analysis findings. The organization of the section is according to research questions and hypotheses. The last section presents a summary of the answers to research questions, together with transitional material linking the findings to Chapter 5.

Data Collection

Sources of Data

There were five primary sources of data used in this study. The first consisted of data compiled and published routinely by the NPA. These comprise various issues of the Abstract of Port Statistics, quarterly performance reports on ports operations from all the ports detailing efficiency indicators and investment performance by concessionaires. These data also include the monitoring and compliance reports of the NPA, collected on a terminal-by-terminal basis for various years, showing basic port data, financial obligations, lease fees, throughput, throughput fees, and operational details. The second source of data consisted of concession agreements executed between the government and the concessionaires. These agreements provide fuller details of the rights and obligations of the parties under the concession. They also describe the agreed-upon postacquisition investment plans of each concessionaire and the expected key performance indicators. The ICRC provided details of the obligations of the parties to the concessions. The ICRC is the agency responsible for the custodianship of these agreements. It also ensures compliance with the terms and conditions of the contracts. In addition, the ICRC prepares routine monitoring and compliance reports for periods covered by the concessions. The third source of data was published information available through the websites of the CBN and the NBS. They included annual abstracts and other publications. I used the data from the later sources to augment and authenticate the data obtained from the first and second sources. The fourth source was the publication of the IMFôs Financial Statistics and the World Bank Indicators. The last source was data obtained for the port terminals operatorsô websites. These

were supplementary to the data already collected and included data from the websites of the following concessionaires:

- Ecomarine Consortium (ñECM Terminals Limited,ò 2016).
- Intels Nig. Limited (ñIntels Nig. Limited,ò 2016).
- Five Star Terminal Logistics Limited (ñFive Star Terminal Logistics Limited,ò 2016).
- Bua Ports and Terminal Limited (ñBua Ports & Terminal Limited,ò 2016).
- ENL Consortium Limited (ñENL Consortium Limited,ò 2016).
- APM Terminals Limited (ñAPM Terminals Limited,ò 2016)..
- Apapa Bulk Terminal Limited (ñApapa Bulk Terminal Limited,ò 2016).
- Dangote Group (ñDangote Group,ò 2016).
- Sifax Group (ñSifax Group,ò 2016).
- Ports and Terminal Operators Limited (ñPorts and Terminal Operators Limited,ò 2016).
- Shoreline Logistics Limited (ñShoreline Logistics. Limited,ò 2016).
- Julius Berger Plc (ñJulius Berger Plc,ò 2016).

Data on Privatization and Economic Growth

Table 3 presents basic economic indicators for Nigeria from 2006 to 2014, together with the Total Productivity Index derived from the DEA analysis. This table summarizes the statistics for the macroeconomic variables used in estimating the economic growth model in the study. The sources of these data were reports published routinely for administrative purposes by the NPA, CBN, NBS, IMFôs Financial Statistics, and World Bank Indicators (2015). In the table,

EFF denotes the total efficiency index, which is the geometric mean of the efficiency of the ports constructed with the use of the DEA. Other variables are DEG (the deregulation variable), OPEN (trade openness as the proxy for trade liberalization), GOV (an index of corruption or the ratio of government consumption to GDP), and GDP_CAP (GDP per capita growth). Additional variables include CREDIT (credit to the private sector as a percentage of GDP), INT (the real interest rate interest), DEBT (total national debt as a percentage of GDP), INF (the inflation rate), annual population growth (LABOR), gross capital formation (CAPITAL), PVA (captures all inflows brought about by the privatization), and CARGO (total volume of inward-and-outward-bound cargo processed, or loaded and unloaded at a port location during a period under review).

Time Frame for Data Collection

The government of Nigeria concluded the concession of the various seaports between 2004 and 2006 and physically handed over the ports to the successful concessionaires toward the end of 2006. As the privately operated ports have been in operation since 2007, the data cover a period from 2007 to 2014, during which time the significant effects of the privatization exercise would have taken effect. Table 3 below shows the indicators for the key variables used in this analysis.

Discrepancies in Data Collection

There were differences between the data expected from the field and the actual data, for many reasons. First, not all of the privatized seaports had commenced full operations 10 years after the commencement of concession period. While some had maintained full operations,

others had maintained only partial operations. One concessionaire ceased operations 1 year into the concession. The reasons usually advanced included insecurity at the waterways due to militant activities in the Niger Delta region, the governmentôs inability to fulfill parts of its covenanted obligations, and the governmentôs failure to hand over sites and property as agreed. Contracted obligations that the government was in breach of included access to common areas, rehabilitation of collapsed quays, and dredging of the ports.

Table 3

Nigerian Economic Indicators 2007–2014

Year	2007	2008	2009	2010	2011	2012	2013	2014
GDP_CAP (US$)	1131.15	1376.86	1091.97	2314.96	2514.15	2739.85	2979.83	3203.3
DEG (%)	46.69	47.14	46.87	47.15	46.97	48.36	48.12	52.66
OPEN (%)	0.69	0.73	0.64	0.42	0.47	0.39	0.34	0.3
GOV (%)	10.18	11.64	12.96	8.71	8.49	8.2	7.16	7.37
CREDIT (%)	25.25	33.75	38.39	15.42	12.48	11.8	12.59	14.54
INT (%)	16.94	15.48	18.36	17.59	16.02	16.79	16.72	16.55
INF (%)	5.38	11.58	11.54	13.72	10.84	12.22	8.48	8.06
DEBT (%)	7.23	6.26	9.36	4.18	4.23	4.08	4.2	4.72
LABOR (m)	45.66	47.01	48.33	49.71	51.17	52.6	54.2	55.78
CAPITAL (m)	15.41	17.33	20.5	63.81	66.75	68.72	76.75	89.83
PVA (m)	74.08	87.77	107.12	84.09	138.57	153.26	167.95	182.64
CARGO (Tons)	57.47	64.37	65.78	76.74	83.46	76.86	76.89	86.6

Note. From CBN Annual Economic Report, International Monetary Fundôs Financial Statistics, World Bank Indicators (2015), Nigerian Bureau of Statistics and Total Productivity Analysis.

Second, it was difficult to obtain reliable figures on port operations, particularly operating costs at the terminal level. Where accurate data existed, they lacked the level of detail necessary to permit terminal-level analysis.

Third, the study used the ñease of doing businessò score of the World Bank as the proxy for the deregulation variable, DEG. The ease-of-doing-business index measures the efficiency of regulation regarding procedures, time, and cost as they affect small and medium-sized enterprises operating in an economy. The higher the ranking for ñease of doing business,ò the more conducive a regulatory environment is to starting and operating a business. Unfortunately, the World Bank only started ranking Nigeria in 2013, even though it had maintained ñdistance to frontierò (DTF) scores since 2004. The DTF score uses 10 indicators to rank countries according to the gap between each economyôs performance and the best possible performance on each indicator (Jayasuriya, 2011, p. 6). In the absence of the ñease of doing businessò rank, I used a composite of the DTF including such variables as the efficiency of starting a business, dealing with construction permits, getting electricity, and the like.

Fourth, it was difficult to obtain the exact amount of postprivatization investment in equipment, technology, and rehabilitation of terminals, given that the actual investment differed significantly for the level of investment covenanted upon by the concessionaires. I used the number of cargo handling equipment purchased as a proxy for investment rather than the actual figures.

Representativeness of the Sample

In choosing the appropriate sample size for the study, I took three factors into consideration. These factors were the number of predictors, the alpha, and the medium effect size. I assumed a total of seven predictors, an alpha Ŭ= .05, and a medium effect size of .15. A computation of sample size with the G-Power software for multiple linear regressions based on

these parameters revealed a sample size of 153 observations. There were 24 (20 DMUs) privatized port terminals in the population, with observations spread across 8 years, resulting in a total of 160 observations. With this sample size, the study had a good chance of detecting any important effects of the privatization exercise.

Empirical Results

Analysis of Port Efficiency Scores

Table 4 below shows the input and output data used in the estimation of the DEA model for Year 8 or Year 2014 only. I have taken care to anonymize the data by removing all identifying characteristics and information from the original dataset to preserve confidentiality and privacy.

The underlying assumption in the analysis of factor productivity in this study is that the productive objectives of the privatized Nigerian ports are the maximization of output and the minimization of inputs. In that case, the total tonnage of inward and outward bound cargo handled by the ports constitutes the output of the ports. The inputs measure the totality of the port infrastructure deployed towards handling the cargo so specified. According to Cullinane and Wang (2010), the inputs comprise the land, labor, and equipment used to produce the throughput in any given year. The quay length, measuring the length of the quay at the port in meters, and terminal size, quantifying the terminal area in hectares; represent the land. The equipment is the pieces of cargo handling equipment used in combination with land and labor to produce the cargo throughput. The equipment is made up of gantry cranes, yard gantry cranes, and straddle carriers.

Table 4

Input and Output of the Port Sector (2014 Only)

Firms (DMUs)	Throughput	Quay length (m)	Terminal size (Ha)	Equipment (nos)	Staff strength (nos)
1	2,970,457	735	11	33	115
2	3,848,739	1,500	21	38	150
3	2,195,382	510	19	20	131
4	5,698,983	1,000	59	97	898
5	1,130,080	660	3,607	6	152
6	978,787	531	4,110	4	645
7	2,770,741	484	6	21	256
8	3,080,025	777	25	56	465
9	1,990,983	438	19	23	183
10	1,484,315	760	17	44	431
11	1,153,379	900	33	17	265
12	1,186,904	1,320	70	15	2,784
13	5,857,057	550	7	32	15
14	120,336	380	4	13	37
15	146,421	890	6	20	308
16	259,181	869	677	17	175
17	27,023	380	43	7	53
18	1,156,791	480	125	17	283
19	604,729	88	32	5	115
20	1,586,362	230	14	9	528

Note. From NPA (various reports), ICRC (compliance monitoring reports), BPEôs Information Memorandum of Ports, port concessionairesôwebsites, concession agreements.

Unlike, Cullinane and Song (2006), González and Trujillo (2008), and Tongzon (1995), who had eliminated labor factor in their analyses, I have included the labor as an input in the

factor productivity analysis for an important reason. Cullinane and Song, Tongzon, and González and Trujillo had assumed that there is a fixed relationship between labor and equipment. According to these scholars, this relationship largely holds true for container ports, but there is a problem with its direct application in this study. As it were, the Nigerian port system handles a complex mix of cargo with different inputs and outputs. All the ports presently handle all types of cargo, although some ports emphasize particular cargo types. The existing cargo types include dry-bulk (wheat, cement), break-bulk (general cargo), unitized/container, liquid bulk (oil services) and role-on-roll-off (all category of vehicles). Owing to the fact that the ports handle a wide variety of cargo, the cargo handling equipment also varied significantly from port to port, and between container ports and other ports. The introduction of the labor force as an input is to reflect this diversity. Labor also served as a proxy for operating costs.

Descriptive and Demographic Characteristics of the Sample

The DEA analysis of the efficiency and productivity of the Nigerian port following privatization used 8 years panel data for the ports from 2007 to 2014. The use of panel data enables the researcher to observe a cross section of data over time, thereby allowing for both a dynamic as well as the cross-sectional analysis of the problem (Frees 2004). This study, for instance, involved a total of 160 observations. Although the government had privatized 24 terminals by on concession, I had to combine some terminals with common operators and locations that continued to maintain combined operations and statistics after the privatization into 20 decision-making units (DMUs). For instance, I had to combine four terminals namely Apapa Terminal ñA and Bò and Apapa Terminal ñC and Dò under concession to Apapa Bulk Terminal

Limited and ENL Consortium respectively, into two DMUs to reflect operational reality. In the same manner, I merged the Onne FLT B and Onne FOT A under concession to INTELS into one DMU. The Warri New Terminal B under concession to Associated Maritime Services ceased operations after 1 year due to the collapse of the quay wall. These developments reduced the number of DMUs from 24 to 20.

The descriptive statistics shown in Table 4.3 indicates that there were no missing data as the recorded sample size, Observations = 160, is the same as the number of observations taken from the 8-year panel study. The mean value of the dependent variable, cargo throughput over the period of 8 years was 1,627,267.76 tons of cargo. In the same vein, the average quay length of the ports, terminal size, pieces of cargo handling equipment deployed and the average staff strength per terminal are 674.07 meters, 445.23 hectares, 24.70 pieces of equipment and 399 employees respectively. Table 5 presents a summary statistics for the data used in the factor productivity analysis.

Table 5

Summary Statistics for Factor Productivity Analysis

	Cargo throughput (tons)	Quay length (meters)	Terminal size (hectares)	Cargo handling equip. (nos)	Staff strength (nos)
Observations	160	160	160	160	160
Minimum	43.00	88.00	4.39	4	15
Maximum	7153066.00	1500.00	4109.75	97	2784
Mean	1627267.76	674.07	445.23	24.70	399.45
Std. Deviation	1523761.57	337.89	1153.08	21.37	590.53
Skewness	1.194	.690	2.645	1.998	3.322
(Std. Error)	.192	.192	.192	.192	.192

Analysis of Factor Productivity

The DEA technique used in the analysis of factor productivity is the Malmquist TFP technique, which readily lends itself to DEA analysis involving panel data. In carrying out the analysis, I had the option of assessing the portsô efficiency based on whether an improvement in productivity is output-oriented or input-oriented. Productivity improvements are output-oriented where the increase arises from an increase in the quantity of the product obtained with a given set of factors. It is input-based where the improvement arises as a result of a reduction in the consumption of factors without reducing the product obtained. This analysis used the output based Malmquist TPF index to measure total productivity changes at the ports and to decompose the productivity changes into technical changes and technical productivity changes.

The total factor productivity indicates the maximum output feasibly obtainable from a given set of factors and technological status. It shows the frontier that limits a firm's productive potential, and beyond which a firm is incapable or producing, given the state of current technology in a given period. Whereas a technological change creates a shift in the frontier, improvements in efficiency indicate a reduction in the distance between a firmôs current production with its combination of factors and products, and the frontier (Díaz-Hernández, Jara-Díaz, & Martínez-Budría, 2008). The Nigerian governmentôs expectation from the privatization of the ports is technical progress and improvements in technical efficiency. Technical progress derives from innovations and changes in production or management techniques, while technical efficiency is a firmôs capacity to manage its resources and to adapt to the environmental conditions in which the firm operates.

In this analysis, I calculated the Malmquist TFP index using the output method, as terminal operators have no capacity to induce new traffics; they just move cargo that arrives at the port. I used the DEAP Fortran-based software provided by Center for Efficiency and Productivity Analysis (Battese & Coelli, 1995).

Table 6

Malmquist TFP Index Summary

Firm	2007 tfpch	2008 tfpch	2009 tfpch	2010 tfpch	2011 tfpch	2012 tfpch	2013 tfpch	2014 tfpch
1	1.314	0.873	1.261	1.041	0.941	0.752	0.990	1.058
2	1.297	1.015	1.009	0.985	1.227	0.827	0.985	1.035
3	1.372	0.963	1.166	1.064	1.016	1.048	1.044	1.049
4	1.596	1.295	0.669	1.229	1.053	0.974	1.155	1.104
5	1.111	1.111	1.022	0.897	0.999	1.200	0.784	1.043
6	3.057	0.974	2.207	1.131	1.049	1.022	0.782	0.941
7	1.111	1.111	1.103	0.925	1.129	1.323	0.975	1.216
8	2.237	1.564	0.875	0.955	1.231	0.998	1.165	0.884
9	1.111	1.111	0.687	0.896	1.037	0.926	1.108	1.162
10	1.111	1.111	1.258	0.630	0.982	1.120	1.130	1.039
11	2.384	0.556	1.427	0.866	4.470	1.733	0.888	1.391
12	1.111	1.111	1.135	0.750	0.987	1.579	1.023	1.368
13	1.111	1.111	37.414	1.920	0.894	0.651	1.128	1.247
14	1.111	0.012	1.000	1.000	1.000	1.000	1.000	27.619
15	1.111	1.111	1.302	1.085	0.445	1.827	1.135	0.923
16	1.111	1.111	1.542	0.946	0.813	1.345	0.920	1.289
17	1.111	0.011	0.392	9.639	0.003	243.953	12.295	0.210
18	1.111	1.389	1.792	0.881	1.357	0.642	0.768	1.474
19	1.111	1.000	2.357	1.389	0.893	0.981	0.982	1.001
20	1.111	1.111	1.143	0.802	1.331	1.414	0.958	0.893
mean	1.315	0.677	1.354	1.111	0.800	1.414	1.121	1.194

Table 6 presents the summary statistics of the ports' efficiency scores for the 20 DMUs over the period 2007 to 2014. In a Malmquist analysis, a firm is experiencing improvement in productivity or efficiency or both wherever the Malmquist TFP or any of its decomposed components is greater than unity. The DMUs or the entire port complex have experienced no improvement where the Malmquist TFP values equal unity.

It then follows that there is a deterioration in productivity, or efficiency (or both) when the TFP is less than unity. Except for years 2008 and 2011, when the mean TFP fell below unity, the results show that on the average, all the privatized terminals in Nigeria experienced improvements in total factor productivity. By 2014, only four firms were still operating below the overall industrial average performance. The DMU identified by Number 17 in Table 6 resumed operations in 2012 after a long lull. This development accounted for the unusual TFP of 243.953 in 2012. In the same vein, the DMU identified as Number 14 also resumed operations in 2014 after operations stalled in 2007, thus accounting for a TFP of 27.619.

Table 7 presents the TFP scores for the 20 DMUs, decomposed into efficiency change (EFFCH), technical efficiency change (TECHCH), pure technical efficiency change (PECH), scale efficiency change (SECH), and total factor productivity change (TFPCH). With a mean Total Productivity index of 1.092, there has been overall in improvement in productivity and efficiency at the ports following the privatization. In general, the ports recorded productivity and efficiency improvements in all the years except for 2008 and 2011. The result also reveals that the major sources of improvement are TECHCH and PECH.

Table 7

Malmquist TFP Index Summary of Firms' Annual Means

Year	effch	techch	pech	sech	tfpch
2007	1.105	1.190	1.062	1.041	1.315
2008	0.669	1.013	1.013	0.660	0.677
2009	1.024	1.323	1.034	0.990	1.354
2010	0.629	1.766	0.651	0.966	1.111
2011	0.886	0.904	1.148	0.772	0.800
2012	1.898	0.745	1.300	1.460	1.414
2013	1.070	1.048	0.961	1.112	1.121
2014	1.031	1.159	0.978	1.054	1.194
mean	0.984	1.110	1.002	0.982	1.092

Determination of the Impact of Privatization on Economic Growth

The growth model I used in determining the impact of privatization on the economy in this study is as follows:

yit = ϐ0 + ϐ1CAPITALit+ ϐ2LABORit + ϐ3CARGOit ï ϐ4EFF(1-i)it + ϐ5DEGit +

ϐ6OPENit + ϐ7GOVit + ϐ8INTit + ϐ9INFit + ϐ10CREDITit + µit (1)

For i =1é ..N, and t = 1 é . T

Where:

EFF = the total efficiency index (EFF) is the average efficiency of the ports constructed with the use of the DEA.

DEG = the institutional factors will include deregulation

OPEN = trade openness as the proxy for trade liberalization

GOV = an index of corruption or the ratio of government consumption to GDP

CREDIT = credit to the private sector as a percentage of GDP

INT = the real interest rate interest

INF = the inflation rate

DEBT = total national debt as a percentage of GDP

PVA = privatization proceed

LABOR = Annual population growth as a proxy for labor

CAPITAL = gross capital formation

Descriptive and Demographic Characteristics of the Sample

I used an 8-year panel data from the privatization of Nigerian ports depicted by Table 3 in estimating the efficiency and productivity of the ports. The Nigerian port system handles a complex mix of cargo with different inputs and output (Valentine & Gray, 2002). This complex mix of cargo with different inputs and output has serious implications for comparison. Despite the differences, there are two major inputs in the port operations that are common to all the ports irrespective of the type of cargo handled. These are capital expenditure and operating expenses, which could serve as fairly representative inputs into the port operations (Kirikal, 2005). I used the total number of cargo handling equipment in use at the ports as the proxy for capital expenditure, and the total number of staff serves as the proxy for operating expenses.

Table 8 shows the descriptive statistics and demographics of the macroeconomic variables used to estimate the economic growth model of ports for the 9^{th} year of ports concession. In all, there are eight variables with no missing variable, the GDP per capital being the criterion variable. The predictors are GDP per capita growth, port inefficiency index, the

proxy for deregulation, trade openness, corruption, credit to private sector, and the real interest rate. Others are inflation rate, external debt, labor force, gross capital formation, privatization proceeds, and cargo throughput. The GDP per capital and gross capital formation are in current US Dollars, cargo throughput is in metric tons, labor is the number of actual workforce, and privatization proceeds is in current US Dollars. The total efficiency index is the geometric mean of efficiency of the ports constructed with the use of the DEA; together with all other variables are percentages.

Table 8

Descriptive Statistics of the Macroeconomic Variables

	N	Minimum	Maximum	Mean	Standard. deviation	Standard Error
Inefficiency index	160	-.9970	242.95	2.153	19.52	12.011
Real interest rate (%)	160	15.48	18.36	16.83	.83	.241
Real inflation rate (%)	160	5.38	13.72	10.75	2.47	-1.122
Credit to private sector % of GDP	160	11.80	38.39	20.10	10.17	.785
Govt expenditure % of GDP	160	16944.95	37798.45	30336.98	7651.49	-.570
Gross capital formation ($ m)	160	15407.43	76749.85	49748.43	25132.17	-.470
Labour force (million)	160	45.66	54.20	50.16	2.81	-.186
External debt ($ m)	160	12029.63	21615.72	16623.66	2992.25	.001
GDP per Capita ($ m)	160	1091.97	2979.83	2111.08	734.37	-.376
GDP per Capita growth ($ m)	160	-284.89	1223.00	273.63	396.55	1.383
Deregulation (%)	160	46.69	52.66	47.99	1.85	1.906
Trade openness (%)	160	29.77	73.18	49.60	15.57	.320
Privatization proceeds ($ m)	160	74.08	182.64	124.44	39.05	.125
Cargo throughput (tons)	160	57.47	86.60	73.52	9.41	-.311
Valid *N* (listwise)	160					

Statistical Assumptions for Multiple Regressions

I used the multiple regressions as the primary tool for analysis in this study. There are eight assumptions, which ensure that the results from a multiple regression will not be misleading. The first assumption is that the dependent variable is either on an interval or ratio scale. Second, there must be two or more independent variables, which should be interval, ratio, ordinal, or nominal variables. Confirmation of these primary assumptions sets the stage for the evaluations of other critical assumptions.

The third assumption is that the dataset must be independent of each other, meaning that there is the independence of residuals. Fourth, the dataset needs to show homoscedasticity, in the sense that the variances along the line of best fit are approximately similar, and the error variance should be constant. Fifth, the independent variables should not exhibit high correlation between each other. In other words, the errors associated with one observation do not have any correlation with the errors of any other observation, implying the absence of multicollinearity. Sixth, there should not be any significant outliers in the dataset. Seventh, the relationship between the predictors and the criterion variable should be linear. Eight, the residuals (errors) should be approximately normally distributed, as technically normality is a necessary condition for the t-tests to be valid. The SPSS Statistics has in-built procedures for checking the last six assumptions (Field, 2013; Laerd Statistics, 2013).

Evaluation of the statistical assumptions for multiple regressions

In evaluating that the dataset for conformity with the assumptions of multiple regression, I first calculated the standardized scores of all the variables in the dataset. A visual examination

of these standardized scores did not reveal any record with absolute values of more than 3.5 (Banerjee & Iglewicz, 2007), which would have indicated the existence of significant outliers. A *Casewise diagnosis* using the SPSS Statistics software also did not reveal any observations whose value exceeds three standard deviations from the mean of observations. Second, I conducted a multicollinearity test by performing a linear regression of the independent variable and dependent variables. The test confirmed the existence of substantial multicollinearity among six of the independent variables, notably the proxy for trade openness (OPEN), annual population growth (LABOR), gross capital formation (CAPITAL), total external national debt (DEBT), credit to the private sector (CREDIT), and the proxy for corruptionð government expenditure (GOV). The *Tolerance statistic* for each of these variables was below 0.20 and the *variance inflation factor (VIF) statistic* was above 5.0. For these reasons, I eliminated the variables from the regression analysis.

To confirm the independence of residuals, I included the Durbin-Watson test in the regression analysis. The result revealed a Durbin-Watson statistic of .136, thus confirming the existence of serial correlation of the residuals. The implication of the existence of serial correlation is that one may wrongly interpret the regression parameter estimates as significant when they are not. I, therefore, used the *First Differenced Method* to correct the serial correlation by first converting all the variables in the dataset into *first differenced*. I then ran a multiple regression analysis of the dataset through the origin without an intercept. The result revealed a new Durbin-Watson statistic of 2.0 confirming the independence of the residuals (Liker et al., 1985a). Table 9 shows the descriptive statistics of the *first differenced* database.

Table 9

Descriptive Statistics of the Macroeconomic Variables

	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. deviation Statistic	Skewness Statistic	Skewness Std. Error
DIFF(GDP_CAP,1)	159	-284.89	1222.99	11.626	105.6610	9.739	.192
DIFF(@1EFF,1)	159	-243.3110	242.6080	-.00264	27.8549	-.037	.192
DIFF(INT,1)	159	-1.57	2.88	-.003	.3019	4.032	.192
DIFF(INF,1)	159	-3.74	6.20	.019	.6527	3.945	.192
DIFF(DEG,1)	159	-.27	4.54	.037	.3798	10.976	.192
DIFF(PVA,1)	159	-23.03	54.48	.682	5.4153	6.427	.192
DIFF(CARGO,1)	159	-6.61	10.97	.183	1.4835	4.694	.192
DIFF(GDP,1)	159	-38583.44	199581.15	2528.66	18152.6137	8.653	.192
DIFF(GDP_GRW,1)	159	-156899.81	238164.58	204.541	23634.1773	4.412	.192
DIFF(GDP_CAP_G,1)	159	-1023.30	1507.89	.673	151.3695	4.070	.192
Valid *N* (listwise)	159						

Fourth, the scatterplot of the standardized residuals against the predicted value showed that the variances along the line of best fit are approximately similar. Fifth, a visual inspection of the normal *P-P plot* of standardized regression residuals confirmed the existence of linearity in the relationship between the dependent variable and each of the independent variables; and the dependent variable and the independent variables collectively. Last, through an inspection of the histogram, superimposed on a normal *P-P plot* of standardized regression residuals, I confirmed that the residuals (errors) are approximately normally distributed.

Report of Statistical Findings

Predictor and criterion variables. In this study the predictor variables are inefficiency index (1-EFF), institutional factors (DEG), real interest rate (INT), inflation rate (INF), privatization proceeds (PRIV), and cargo throughput (CARGO) while the criterion variables are

the gross domestic product (GDP), annual GDP growth (GDP_GRW), GDP per capita (GDP_CAP), and GDP per capita growth (GDP_CAP_G). Table 10 presents the variables in the study:

Table 10

Impact of Port Sector on the Economy Variables

Variables	Definition
GDP	Value of the annual GDP
GDP_GRW	Annual GDP growth
GDP_CAP	GDP per capita
GDP_CAP_G	GDP per capita growth
I_EFF	Inefficiency Index 1-EFF.
DEG	Deregulations as proxy for institutional factors
INT	The real interest rate interest
INF	Inflation rate
PRV	Priv. proceeds-aggregate privatization investment
CARGO	Cargo throughput-volume inward-outward-bound cargo

Impact on annual GDP. I conducted a multiple regression analysis to evaluate how well the linear combination of the inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput predicted the level of annual GDP in the Nigerian economy. The predictors are inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput, while the criterion variable was GDP. The linear combination of the inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput was significantly related to the GDP $F(6, 152) = 30.30$, $p < 0.001$. The sampleôs multiple correlation coefficient was .73, indicating that the linear combination of inefficiency index,

deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput accounted for approximately 54% of the variations in GDP per capita in the Nigerian economy.

Table 11 below presents the indices showoff the relative strengths of the individual predictors. The bivariate correlation of inefficiency index, interest rate and priv. proceeds with GDP per capita was negative while the bivariate correlations between inflation rate, deregulation, cargo throughput, and GDP Growth were positive. The bivariate correlation between interest rate, inflation rate, deregulation, privatization proceeds, and cargo throughput; and GDP per capita were statistically significant, ($p < 0.05$). The predictor equation for the standardized variable is as follows:

ZGDP_CAP =.55 Zcargo_throughput - .12Zpriv_proceeds + .22Zinflation_rate + .18Zderagulation - .14Zinterest_rate

Impact on annual GDP growth. I also conducted a multiple regression analysis to evaluate how well the linear combination of the inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput predicted the level of GDP growth in the Nigerian

Table 11

Summary of Multiple Regression Analysis for Predictors of GDP

Predictors	*b*	SE B	ɓ	*p*
Inefficiency index	-.595	35.964	-.001	.987
Interest rate	-8436.391	3831.301	-.139	.029**
Inflation rate	6286.411	1688.164	.224	.000*
Deregulation	8633.912	3122.314	.180	.006**
Priv. proceeds	-391.972	196.797	-.117	.048**
Cargo throughput	6760.734	868.129	.551	.000*

Note. R^2 = .54.

*$p < .005$, **$p < .05$.

economy. The predictors are inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput, while the criterion variable was GDP growth.

The linear combination of the inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput was significantly related to the GDP per capita $F(6, 153) = 121.38$, $p < 0.001$. The sampleôs multiple correlation coefficients was .91, indicating that the linear combination of inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput accounted for approximately 83% of the variations in GDP per capita in the Nigerian economy.

I also conducted a *posthoc* test to determine the relative strengths of the individual predictors. The bivariate correlation of inefficiency index, interest rate, and priv. proceeds with GDP per capita was negative while the bivariate correlations between inflation rate, deregulation, and cargo throughput, and GDP Growth was positive. Table 12 shows that the bivariate correlation between inflation rate, deregulation, privatization proceeds, and cargo throughput; and GDP growth were statistically significant, ($p < 0.001$). On the strength of this analysis, one can conclude that the predictors of GDP per capita are inflation rate, deregulation, privatization proceeds, and cargo throughput.

The predictor equation for the standardized variable is as follows:

ZGDP_CAP =.35 Zcargo_throughput - .78Zpriv_proceeds + .28Zinflation_rate + .18Zderagulation.

Table 12

Summary of Multiple Regression Analysis for Predictors of GDP Growth

Predictors	*b*	SE B	ϐ	*p*
Inefficiency index	-.491	28.582	-.001	.986
Interest rate	-2883.170	3044.933	-.037	.345
Inflation rate	10087.541	1341.671	.279	.000*
Deregulation	11099.304	2481.464	.179	.000*
Priv. proceeds	-3381.843	156.405	-.781	.000*
Cargo throughput	5493.945	689.947	.347	.000*

Note. R^2 = .83.
*p < .005, **p < .05

Impact on GDP per capita. I further conducted a multiple regression analysis to evaluate how well the linear combination of the inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput predicted the level of GDP per capita in the Nigerian economy. The results reveal that the predictors are inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput, while the criterion variable was GDP per capita. The linear combination of the inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput was significantly related to the GDP per capita F(6, 153) = 39.08, p <0.001. The sampleôs multiple correlation coefficients was .78, indicating that the linear combination of inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput accounted for approximately 61% of the variations in GDP per capita in the Nigerian economy.

The result of the *posthoc test*, presented in Table 13, shows the relative strengths of the individual predictors. The bivariate correlation of inefficiency index, interest rate, and priv. proceeds with GDP per capita was negative while the bivariate correlations between inflation

rate, deregulation, and cargo throughput, and GDP Growth were positive. The bivariate correlation between interest rate, inflation rate, deregulation, privatization proceeds, and cargo throughput; and GDP per capita were statistically significant, ($p < 0.05$). On the strength of these analyses, one can conclude that the predictors of GDP per capita are interest rate, inflation rate, deregulation, privatization proceeds, and cargo throughput.

The predictor equation for the standardized variable is as follows:

ZGDP_CAP =.59 Zcargo_throughput +.25Zpriv_proceeds. + .22Zinflation_rate-

.16Zinterest_rate + .15Zderegulation (2)

Table 13

Summary of Multiple Regression Analysis for Predictors of GDP per Capita

Predictors	*b*	SE B	ɓ	*p*
Inefficiency index	-.003	.194	-.001	.990
Interest rate	-57.698	20.654	-.164	.006**
Inflation rate	35.529	9.101	.218	.000**
Deregulation	40.624	16.832	.146	.017**
Priv. proceeds	-4.860	1.061	.250	.000*
Cargo throughput	41.622	4.680	.585	.000*

Note. $R^2 = .61$.
*$p < .005$, **$p < .05$.

Impact on GDP per capita growth. Finally, I conducted a multiple regression analysis to evaluate how well the linear combination of the inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput predicted the level of GDP per capita growth in the Nigerian economy. The predictors are inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput, while the criterion variable was GDP per capita growth. The linear combination of the inefficiency index, deregulation, interest rate,

inflation rate, priv. proceeds, and cargo throughput was significantly related to the GDP per capita F(6, 153) = 130.86, p <0.001. The sampleôs multiple correlation coefficient was .92, indicating that the linear combination of inefficiency index, deregulation, interest rate, inflation rate, priv. proceeds, and cargo throughput accounted for approximately 84% of the variations in GDP per capita growth in the Nigerian economy.

Table 14 presents the result of the *posthoc* test, showing the relative strengths of the individual predictors. The bivariate correlation of inefficiency index, interest rate and priv. proceeds with GDP per capita was negative while the bivariate correlations between inflation rate, deregulation, and cargo throughput and GDP Growth were positive. The bivariate correlation between interest rate, inflation rate, deregulation, privatization proceeds, and cargo throughput; and GDP per capita were statistically significant, (p < 0.001). On the strength of these analyses, one can conclude that the predictors of GDP per capita are inflation rate, deregulation, privatization proceeds, and cargo throughput.

Table 14

Summary of Multiple Regression Analysis for Predictors of GDP per Capita Growth

Predictors	*b*	SE B	ß	*p*
Inefficiency index	-.003	.177	-.001	.986
Interest rate	-22.558	18.901	-.045	.235
Inflation rate	63.886	8.328	.276	.000*
Deregulation	70.036	15.403	.177	.000*
Priv. proceeds	-21.972	.971	-.792	.000*
Cargo throughput	34.088	4.283	.337	.000*

Note. R^2 = .84.
*p < .005.

The predictor equation for the standardized variable is as follows:

ZGDP_CAP =.34Zcargo_throughput - .79Zpriv_proceeds. + .28Zinflation_rate-

.05Zinterest_rate + .18Zderegulation

Testing the Channel of Transmission

In this study, the possibility exists of a reciprocal causation between the GDP, together with other aggregate economic indicators and productivity improvements at the ports (Udoka & Anyingang, 2012: Seabrooke et al., 2003). There is also the likelihood that the GDP may also be dependent on the level of postprivatization investment and productivity efficiency changes brought about by the privatization policy. Where it is possible for the relationships between the variables to be bidirectional, it becomes difficult to determine the effects that are attributable to the privatization exercise directly and those associated with other intervening variables without controlling for the influence of the covariates. I used the 2SLS regression analyses to discern the respective influences. The following equations depict the expected relationship:

$$EFF_{it} = ß0 + ß1PVA_{it} + ß2Credit_{it} + \mu \quad (3)$$

$$CARGO_{it} = ß0 + ß1PVA_{it} + ß2GDP_{it} + ß3OPEN_{it} + ß4DEG_{it} + ß5GOV_{it} + ß6INF_{it} + ß7INT_{it} + ß7DEBT_{it} + \mu_{it} \quad (4)$$

$$GDP_{it} = ß0 + ß1PVA_{it} + ß2CARGO_{it} + ß3OPEN_{it} + ß4DEG_{it} + ß5GOV_{it} + ß6INF_{it} + ß7INT_{it} + ß7DEBT_{it} + \mu_{it} \quad (5)$$

For i =1é ..N, and t = 1 é . T

The descriptive statistics of the data used for testing the channels of transmission of growth to the economy by the ports are the same as those depicted in Table 9.

Evaluating the Statistical Assumptions for a Two-Stage Least Square Regression.

The statistical assumptions for a two-stage least square (2SLS) regression are (a) the dependent and independent variables are quantitative; (b) the predictor or endogenous explanatory variables are quantitative; (c) the distribution of the criterion variable is normal for each value of the predictor variable; (d) the variance of the distribution of the criterion variable is constant for all values of the predictor variable; and (e) the relationship between the criterion variable and each predictor variable is linear.

An examination of the dataset for the analysis reveals that the dependent and independent variables are both quantitative; the predictor variables are also quantitative; and the distribution of the criterion variable is normal for each value of the predictor variable as was revealed by an inspection of the histogram, superimposed on a normal P-P plot of standardized regression residuals. A visual inspection of the normal P-P plot of standardized regression residuals revealed the existence of linearity in the relationship between the dependent variable and each of the independent variables.

Report of Statistical Analysis Findings

I conducted four two-stage least square regression analyses to determine the effects that are attributable to the privatization exercise directly and those associated with other intervening variables. In the analyses, the predictor variables are priv. proceeds, and cargo throughput. The instrumental variables are inefficiency index, interest rate, inflation rate, deregulation, privatization proceeds, trade openness, and credit to the private sector while the dependent variables are GDP, GDP growth, GDP per capita, and GDP per capita growth in each of the four

2SLS regressions. I included the inefficiency index in the analyses as an instrumental variable. The index was not statistically significant as a predictor of the GDP, GDP growth, GDP per capita, and GDP per capita growth. First, the linear combination of port inefficiency, and cargo throughput was significantly related to GDP F (2, 156) = 31.55, p <0.001. The sampleôs multiple correlation coefficients was 0.53, indicating that the transmission mechanism of approximately 29% of the GDP per capita is through decreases in port inefficiency, and increases in cargo throughput.

In the second regression, the linear combination of port inefficiency, and cargo throughput was significantly related to GDP growth F (2, 156) = 31.55, p <0.001. The sample multiple correlation coefficient was 0.53, indicating that the transmission mechanism of approximately 29% of the GDP per capita is through decreases in port inefficiency, and increases in cargo throughput.

The result of the third 2SLS regression indicates that the linear combination of port inefficiency, and cargo throughput was significantly related to GDP per capita F (2, 156) = 31.55, p <0.001. The sample multiple correlation coefficient was 0.53, indicating that the transmission mechanism of approximately 29% of the GDP per capita is through decreases in port inefficiency and increases in cargo throughput.

Last, the linear combination of port inefficiency, and cargo throughput was significantly related to GDP F (2, 156) = 29.03, p <0.001. The sample multiple correlation coefficients was 0.52, indicating that the transmission mechanism of approximately 27% of the GDP was through increases in both privatization proceeds, and cargo throughput. Table 15 shows the relative

strengths of the individual transmission mechanism for GDP only. The bivariate correlation between privatization proceeds, and cargo throughput; and GDP were positive and statistically significant, ($p < 0.001$).

In the same vein, the linear combination of port inefficiency, and cargo throughput was significantly related to GDP growth $F (2, 156) = 25.48$, $p < 0.001$. The sample multiple correlation coefficient was 0.50, indicating that the transmission mechanism of approximately 25% of the GDP was through decreases in increases in both privatization proceeds, and cargo throughput. The bivariate correlation between privatization proceeds, and cargo throughput; and GDP growth were positive and statistically significant, ($p < 0.001$).

With regard to the GDP per capita, the linear combination of port inefficiency, and cargo throughput was significantly related to GDP per capita $F(2, 156) = 31.55$, $p < 0.001$. The sample multiple correlation coefficient was 0.54, indicating that the transmission mechanism of approximately 28% of the GDP was through decreases in increases in both privatization proceeds and cargo throughput. The bivariate correlation between privatization proceeds, and cargo throughput; and GDP growth were positive and statistically significant, ($p < 0.001$).

Last, the linear combination of port inefficiency, and cargo throughput was significantly related to GDP per capita growth $F (2, 156) = 25.95$, $p < 0.001$. The sample multiple correlation coefficient was 0.50, indicating that the transmission mechanism of approximately 25% of the GDP was through increases in both privatization proceeds, and cargo throughput. The bivariate correlation between privatization proceeds, and cargo throughput; and GDP growth were positive and statistically significant, ($p < 0.001$).

Results of the Test for Transmission Mechanism

According to the literature, transmission of policies such as privatization to the economy could occur only where the coefficients of the predictors are statistically significant and also greater than zero (Kessy, 2008). The 2SLS regression analyses revealed that only the cargo throughput for which the coefficient is greater than zero, although the coefficients of privatization, and cargo throughput were both statistically significant. On the strength of these 2SLS analyses, the logical conclusion is that the channel through which the privatization policy transmitted the variations in the GDP, GDP growth, GDP per capita, and GDP per capita growth was through increases in the cargo throughput.

Table 15

Summary of Two-Stage Least Square Regression Analysis for Predictors of GDP per Capita

Predictors	*b*	SE B	ϐ	*p*
Cargo throughput	80.26	10.13	1.13	.000*
Priv. proceeds	-18.13	5.17	-.93	.000*

Note. R^2 =.29.
*$p < .001$.

Testing for the Direction of Control

Apart from third variable problem, which I addressed in the next section, one other major limitation of correlational studies lies in inferring a cause-effect relationship between the dependent and predictor variables (Kenny, 1975). In addressing this problem of directionality, I used the Time Series Panel Regression to assess whether the residuals are exhibiting any relationship with respect to time.

I conducted a regression of GDP, GDP growth, GDP per capita, and GDP per capita growth; together with deregulation, interest rate, privatization proceeds, and cargo throughput to obtain the unstandardized errors scores, which I lagged for 3 years to obtain a first, second, and third order lagged variables. I further conducted a partial correlation of time (years), and the third order lagged unstandardized errors while controlling for the previously lagged variables. The result of the partial correlation using the lagged residuals from GDP per capita only shows that there was a low correlation between the time, and the third order lagged residual, controlling for the previous lags. The low correlation was not statistically significant (r[97] = .13, n =157, p>.05). The Pearsonôproduct-moment correlation is also low and positive but not statistically significant (r [99] = .12, n = 101, p > .05). Table 16 shows the result of the bivariate and partial correlation between the variable Year and 2-year lagged residuals, controlling for previous lags.

Table 16

Bivariate and Partial Correlation Between Year and 2-Year Lagged Residuals, Controlling for Previous Lags

	Year	3-year lagged unstandardized residual	1-year lagged unstandardized residual
3-year lagged residual			
2-year lagged residual	.044		
1-year lagged residual	.044	-.006	
Unstandardized residual	.000	.000	000
Year		.044	
3-year lagged residual	.044		

*$p < .05$ for the bivariate correlations.

**$p < .005$ for partial correlations.

Controlling for the Third Variable Problem

Concerning the third variable problem, the literature recommends the use of the partial correlation analysis. Partial correlation addresses the presence of a third confounding variable that invariably leads to a mistaken causal relationship between two other variables. It measures the strength and direction of the linear relationship between two variables while controlling for the covariates.

Table 17

Bivariate and Partial Correlation Between GDP per Capita and Cargo Throughput, Controlling for the Covariates

	GDP per capita	Cargo throughput	Inefficiency . index	Interest rate	Inflation rate	Deregula-tion
GDP per capita						
Cargo throughput	.67**					
Inefficiency. index	-.000	.000	.			
Interest rate	-.449**	-.462**	.000			
Inflation rate	.276**	.000	-.000	-.142		
Deregulation	.289**	.431**	.000	.044	-.286**	.
Priv. proceeds	-.15*	.206*	.000	.093	-.286**	.196*
GDP per capita		.581**				
Inefficiency index	.581**					

*$p < .05$ for the bivariate correlations.
**$p < .005$ for partial correlations.

The analysis involved the computation of correlation coefficient between GDP, GDP growth, GDP per capita, and GDP per capita growth in each instant and the cargo throughput while controlling for inefficiency index, deregulation, interest rate, inflation rate, and postprivatization proceeds. The result of the partial correlation show that there was strong correlation between the dependent variable GDP per capita and the independent variable cargo

throughput, controlling for inefficiency index, deregulation, interest rate, inflation rate, and privatization proceeds, which is statistically significant (r[152] = .58, n =159, p<.001).

In the same vein, the Pearsonôproduct-moment correlation between GDP per capita and the independent variable cargo throughput, without controlling for the variables for inefficiency index, deregulation, interest rate, inflation rate, credit to the private sector, gross capital formation, and privatization proceeds, was also strong and statistically significant between GDP per capita and the independent Inefficiency Index (r [158] = .67, n = 159, p > .001). Table 17 shows the bivariate and partial correlation between GDP per capital and cargo throughput while controlling for the covariates.

I also computed the correlation coefficients between GDP, GDP growth, GDP per capita, and GDP per capita growth in each instant and the priv. proceeds, to confirm the relationship between the dependent variable and the priv. proceeds while controlling for the variables for inefficiency index, deregulation, interest rate, inflation rate, and cargo throughput. The result of the partial correlation shows a very high correlation between the dependent variable GDP per capita only and the independent variable priv. proceeds, controlling for the variables for inefficiency index, deregulation, interest rate, inflation rate, and cargo throughput, which was statistically significant (r[152] = .35, n =159, p<.001).

The Pearsonôproduct-moment correlation between GDP per capita and the independent cargo throughput, without controlling for the variables for inefficiency index, deregulation, interest rate, inflation rate, gross capital formation, and privatization proceeds, is not statistically significant, low and positive between GDP per capita Growth only and the independent cargo

throughput (r[157] = .15, n = 159, p < .001). Table 15 depicts the bivariate and partial correlation between GDP per capital and priv. proceeds while controlling for the covariates.

Table 18

Bivariate and Partial Correlation Between GDP per Capita and Privatization Proceeds, Controlling for the Covariates

	GDP per capita	Priv. proceeds	Inefficiency index	Interest. rate	Inflation rate	Deregulation
GDP per capita						
Priv. proceeds	.154					
Inefficiency index	-.001	.000	.			
Interest rate	-.449**	-.093	.000			
Inflation rate	.276**	-.286**	-.001	-.142		
Deregulation	.289**	.196**	.000	.044	-.286**	.
Cargo throughput	.668**	.206*	.000	.093	-.008**	.431**
GDP per capita		.353**				
Inefficiency index	.353**					

*p < .05 for the bivariate correlations.

**p < .005 for partial correlations.

Summary

The objective of this quantitative study was to examine the empirical relationship between privatization and economic growth, using data from the privatization of Nigerian ports. The central research question of the study is as follows: What is the effect of port concession on economic growth? To answer the research question, I examined whether the productivity efficiency changes experienced at the ports following the privatization were directly attributable to the privatization exercise. I further assessed the nature of the association, the form, and the strength of the relationship. Additionally, I determined whether the changes that accompanied

the ports privatization could provide an explanation for the variations in the GDP, GDP growth, GDP per capita, and GDP per capita growth in Nigeria.

A productivity efficiency assessment using the Malmquist Total Productivity Function (TFP) technique to measure total productivity changes at the ports, revealed a mean TFP index of 1.092. This score indicates an overall but very modest improvement in productivity and efficiency at the ports following privatization. The ports recorded productivity and efficiency improvements in all the years with the exceptions of 2008 and 2011. The analysis also showed that the recorded efficiency improvements were in the areas of TECHCH and PECH Thus, the improvements arouse largely as a result of changes in innovation, production processesôand management technique. Other possible drivers of the recorded improvements include an enhanced change capacity of the concessionaire to manage its resources, and adapt to the new private sector-driven environmental conditions brought about by the concession. On the average, the modest efficiency change recorded did not include any increases in the scale of operations.

The second subquestion sought to determine whether the postprivatization productive efficiency at the ports could provide an explanation for the changes in the GDP, GDP growth, GDP per capita, and GDP per capita growth in Nigeria? The multiple regression analysis revealed that the linear combination of interest rate, inflation rate, deregulation, privatization proceeds, and cargo throughput was significantly related to GDP, GDP growth, GDP per capita, and GDP per capita growth. The sample correlation coefficient was .73, .91, .78, and .92 for GDP, GDP growth, GDP per capita, and GDP per capita growth respectfully. Thus, indicating that the linear combination of interest rate, inflation rate, deregulation, privatization proceeds,

and cargo throughput accounted for approximately 54%, 83%, 61% and 84% respectfully of the variation in GDP, GDP growth, GDP per capita, and GDP per capita growth in Nigeria. The bivariate correlation of inefficiency index, interest rate, and priv. proceeds with GDP per capita was negative in all instances while the bivariate correlations between inflation rate, deregulation, cargo throughput, and GDP per capita were positive. The bivariate correlation between interest rate, inflation rate, deregulation, privatization proceeds, and cargo throughput; and GDP per capita were statistically significant. The result of the partial correlation of time and the lagged residuals indicated no significant correlation between time and the residuals, thus confirming the cause-effect relationship between the dependent and predictor variables.

Additionally, the regression analysis revealed that the coefficient of cargo throughput is greater than zero in all instances, thus confirming that cargo throughput was the major channel through with the privatization of the ports transmitted growth to the economy. The coefficient of postprivatization proceeds, on the other hand, was less than zero although statistically significant. It then follows that postprivatization proceeds was not one of the channels through which the privatization process transmitted growth to the Nigerian economy (Kessy, 2008). However, the linear combination of cargo throughput and priv. proceeds only explained between 27%, 25%, 28%, and 27% respectively of the observed changes in GDP, GDP growth, GDP per capita, and GDP per capita growth at the Nigerian economy.

Transitional Material From the Findings

Chapter 5 of this study provided an interpretation of the results of this chapter and how the findings could add to the existing body of knowledge in policy administration. The chapter

also discussed the limitations of the study in terms of generalizability, validity, and reliability. Additionally, Chapter 5 examined and discussed the theory and methods used in this study and its empirical implications for the advancement of knowledge, and the implications of the findings for policymaking and social change. The chapter concluded by providing a parting message that captures the crux of the study.

Chapter 5: Summary, Conclusion, and Recommendations

Introduction

Purpose and Nature of the Study

The objective of this quantitative study was to examine the empirical relationship between the privatization policy and economic growth. The Nigerian government has been implementing the privatization program since the early 1980s as part of the SAP put forward by the World Bank and the IMF for restructuring nonperforming economies for growth in the early 1980s. Other components of the SAP were sector deregulation and trade liberalization policies. By the end of 2014, the Nigerian government had privatized over 167 SOEs, including 24 seaports.

This quantitative study used 8-year panel data on port efficiency and productivity from the privatization of Nigerian ports in its analysis. The central question that guided the research was whether the variations in efficiency and productivity that accompanied the privatization of the ports could provide some explanations for the changes in the countryôs economic growth following the privatization exercise. The subquestions that derived from the main research question were the following:

1. What is the effect of the postprivatization investment on productive efficiency of the ports after privatization?
2. To what extent does the postprivatization productive efficiency of the ports predict changes in GDP, GDP growth, GDP per capita, and GDP per capita growth?

Review of Methodology

The study used the output-based Malmquist total factor productivity (TFP) index to provide an answer to the first research subquestion. The Malmquist TPF index measures the total productivity variations at ports and decomposes total productivity changes into technical and technical productivity components. The study also used the correlational research design and multiple regression analysis in the determination of the impact of the productivity improvements at the ports on economic growth following privatization. The analyses further involved the use of two-stage least square regression analysis to isolate the mechanism through which the ports influenced economic growth. By design, the correlational design has two major limitations. The first relates to the difficulty in inferring a cause-effect relationship between the dependent and predictor variables. The second limitation is the possibility of the existence of intervening variables or third confounding variable that may lead to a mistaken causal relationship between two other variables. The study used the time-lagged correlational design to determine the exact direction of control and partial correlation analysis to resolve the challenge of the intervening variables.

The study used secondary data for the analysis due to the fact there are in existence well-documented port data and information on postprivatization compliance monitoring, which the NPA and other regulatory institutions routinely publish.

Summary of Key Findings

A productivity efficiency assessment using the Malmquist TPF technique provided an answer to the first subquestion. The analysis revealed a mean TFP index of 1.057. This score,

being above unity, indicates that there has been an overall improvement in productivity and efficiency at the ports accompanying the privatization exercise. The ports recorded modest productivity and efficiency improvements in all of the years except 2007 and 2011. The analysis also showed that the recorded efficiency improvements were in the areas of technical efficiency change (TECHCH) and pure technical efficiency change (PECH). This result implies that the gains from the privatization of the ports arose mainly as a result of changes in innovation, production processes, and management technique, together with the concessionaireôs capacity to manage its resources and to adapt to the new private-sector-driven environmental conditions.

The second subquestion sought to determine whether the postprivatization productivity and efficiency improvements at the ports could explain the variations in the GDP, GDP growth, GDP per capita, and GDP per capita growth in the years following port privatization in Nigeria. The result of the multiple regression analysis revealed that the linear combination of port efficiency (reduction in inefficiency), deregulation, interest rate, inflation rate, privatization proceeds, and cargo throughput was significantly related to GDP, GDP growth, GDP per capita, and GDP per capita growth in Nigeria. This result indicates that the linear combination of cargo throughput, privatization proceeds, inflation rate, deregulation index, and interest rate accounted for significant variations in GDP, GDP growth, GDP per capita and GDP per capita growth in Nigeria. In all instances, the port efficiency variable was not statistically significant.

Except for interest rate and privatization proceeds whose bivariate correlation with GDP, GDP growth, GDP per capita, and GDP per capita growth was negative, all other bivariate correlations between interest rate, inflation rate, deregulation index, privatization proceeds, and

cargo throughput and the dependent variables were positive. The result of the partial correlation of time and the lagged residuals shows no significant correlation between time and the errors, thus confirming the cause-effect relationship between the dependent and predictor variables.

Additionally, the regression analysis revealed that the coefficients of cargo throughput were greater than zero in all instances, thus confirming cargo throughput as one of the channels through which the privatization of the ports transmitted growth to the economy. The coefficients of postprivatization proceeds in all the regressions, however, were less than zero, although they were statistically significant. It then follows that postprivatization proceeds are not among the channels through which the privatization process transmitted growth to the Nigerian economy (Kessy, 2008). The result also indicate that the linear combination of cargo throughput and privatization proceeds provided only moderate explanation of the observed changes in GDP, GDP growth, GDP per capita, and GDP per capita growth in the Nigerian economy.

Organization of Chapter 5

Chapter 5 provides an interpretation of the results of the analyses conducted in Chapter 4 and how the findings add to the existing body of knowledge in policy administration. Apart from the introductory section, which provides a concise presentation of the purpose and nature of the study and a summary of the key findings, the chapter consists of four sections. These are the interpretation of the conclusions of the study, limitations of the study, recommendations, and conclusion. In presenting an interpretation of the research findings, I describe the ways in which the study confirmed, disconfirmed, or extended knowledge regarding economic development, policy administration, and analysis. I compare the results with peer-reviewed literature in the

fields of economic development, privatization, property rights and allied theories, and public administration. The third section contains a discussion of the limitations of the study in relation to issues of generalizability, validity, and reliability. In the next section, I examine and consider the theory and methods used in this study and its empirical implications for the advancement of knowledge. I also discuss the implications of the findings for policymaking and social change. The chapter concludes with a parting message that captures the crux of the study.

Interpretation of the Findings

Privatization and Economic Growth

Over the past 30 years, countries have been deploying privatization for purposes of economic structuring and stabilization, and in the hope of higher economic performance. The transition economies of Eastern Europe pursued the privatization of SOEs as a vehicle for transiting from state-controlled economies of the Soviet era to market-driven economies quickly. Most other countries, particularly those of subsaharan Africa, embarked on privatization due to increasing budgetary constraints, growing foreign debt, rising inflation, and growing balance-of-payment difficulties in the 1980s (Al-Obaidan, 2002). For the latter group, the World Bank and the IMF insisted on a strict implementation of economic reforms, including privatization as a condition for providing a much-needed economic lifeline and assistance. The neoliberal theories of the period provided the verve for this movement at the time.

A review of existing literature indicated that there are five discernible strands of privatization-related studies. The first strand consisted of studies on the economic impact of privatization. The second involved studies had its focus on the impact of postprivatization

efficiency and productivity on the firm. The third category of studies emphasized the impact of privatization methods. The fourth set of studies related to the determinants of privatization success. The last group of studies addressed the effect of privatization on income distribution, employment, and the cost of living. All of these studies emphasize the various aspects of the impact of privatization on society. This study related to only two groupings of the privatization-related inquiries in the literature. First, there are studies that stressed the macroeconomic economic implications of privatization, as exemplified by the studies of Al-Obaidan, 2002 and Cook and Uchida (2003)). The second category consists of studies concentrated on the impact of privatization on the output, profitability, investment, and efficiency gains of privatized firms (Abdou & Moshiri, 2009).

The privatization-related studies that were directly relevant to this study were those that examined economic impact and efficiency. The study combined the theory, design, and methodologies of these two strands of research in the analysis.

Privatization and Economic Growth Theories

Filipovic (2005) carried out a regression of per capita growth with privatization proceeds in 94 countries and arrived at some conclusions. First, privatization on its own is not a significant predictor of economic growth, although it could be with a high content of FDI. Second, core investors will not be incentivized to make the additional investment if property rights are weak in a country. Third, the existence of healthy competition in a country tends to magnify the effect of privatization. Last, the effect of privatization depends on the strength of other reforms such as deregulation and trade liberalization. Filipovic (2005), however, conceded that due to limited

data at the time, it was not possible to generalize his findings. Plane (1997) insisted that privatization has a positive effect on GDP growth, although privatization policy has little or no impact on economies that do not implement deregulation and trade-liberalization policies simultaneously.

In their analysis, Abdou and Moshiri (2009) assessed the impact of privatization on capital formation in 105 developing countries. Their conclusion was that the effect of privatization on capital formation is contextual, and depends on the region, country, and timing of the privatization. They also concluded that the level of postprivatization investment is not significant in predicting growth. According to Abdou and Moshiri, developing countries have the opportunity to escalate their economic performance by as much as 45% if they can transform their economics from a state-controlled to a market-based structure (Al-Obaidan, 2002). Furthermore, the ability of a country to strengthen institutions, create a transparent environment, and promote appropriate internal policies combines with other policy reforms to ensuring the success of privatization (Plane, 1997). The designs of all of these studies were variants of multiple regression analysis using basic economic productivity models.

There were some studies whose findings departed from the mainstream view that the effects of privatization are beneficial to an economy. In their analysis of the impact of privatization on economic growth across 63 countries, Cook and Uchida (2003) concluded that there is a robust negative correlation between privatization and economic growth in developing countries. However, Cook and Uchida they did concede that it is possible for privatization to induce other structural changes in an economy. The latter assertion, they further added, would

require further studies for confirmation. Despite this disagreement, there appears to be some unanimity in views among scholars that privatization has an important role to play in stimulating an economy, particularly in countries with strong market institutions, and in supporting the protection of property rights. Even in countries with poorly developed market institutions, privatization has played a catalytic role in economic development (Al-Obaidan, 2002). The proviso, though, is that governments implementing the privatization program must complement the exercise with other reforms such as trade liberalization and deregulation. Developing countries that is consistent in creating strong market institutions while implementing privatization experience significant growth (Barnett, 2000; Cook & Uchida, 2003; Filipovic, 2005; Plane, 1997).

Studies also exist that indicate reciprocal causality between productivity improvements at the ports and changes in the GDP and other aggregate economic indicators (Seabrooke et al., 2003). The findings in Plane (1997) further complicated the complex web of relationships associated with the port privatization. According to Plane, privatization policy has little or no impact on economies not implementing deregulation and trade liberalization policies simultaneously. This web of interrelationships apparently makes it difficult to distinguish between the postprivatization changes at the ports attributable to the privatization exercise and those associated with other intervening and confounding variables without controlling for the influence of the covariates.

Port Privatization and Economic Growth

There is empirical evidence of a close, if not a causal association between port development and a countryôs economic growth. In their study of the effects of the improvement of port logistics on economic growth in the Zhejiang Province in China, Huang and Peng (2014) found that the logistics industry in Zhejiang Province was one of the most important factors influencing economic development. Liu and Li (2007) also found reciprocal causation between developments in the logistics industry and economic growth. This view also received support from such studies as Huang and Peng (2014) and Yang and Jianguo (2011).

In summary, (a) privatization with a high content of FDI contributes significantly to economic growth; (b) countries with weak property rights are unlikely to attract core investors; (c) the presence of strong institutions and market structures and healthy competition in a country tends to multiply the effect of privatization; (d) the impact of privatization depends on the strength of other reforms such as deregulation and trade liberalization; (e) developing countries can ramp up their economic grow significantly; and (f) the success of any privatization program is contextual and cannot happen to the exclusion of other policy initiatives. What was not very clear from the studies was the sustainability of the gains of privatization long after the implementation of the privatization program. The literature is not well supplied with research in this area (Plane, 1997).

Privatization and Corruption. Privatization is one of the policy measures advanced by the neoliberal school to diminish the influence of the state in economic policymaking. The underlying argument against the growing influence of governments was that there is a tendency

of making allocative decisions based on self-interest only when policymaking rests with organizations whose control is in the hands of politicians, bureaucrats and interest groups. As the argument goes, this tendency resulted only in creating inefficient industries that require permanent subsidization for survival (Önık, 1991). Furthermore, such interventions produce suboptimal decisions by the political state, and socially undesirable outcomes including the existence of excess capacity, protection of high-cost producers, rent-seeking costs, and the like (Woo-Cumings, 1999). Thus, an increase in government expenditure under the regime of fiscal constraint is a measure of bad government. Cook and Uchida (2003), Filipovic (2005), and (Ifionu & Ogbuagu, 2013) used government expenditure as an indication of political corruption and bad government. This study used the ratio of government expenditure to GDP (GOV) to control for bad governance.

However, GOVð the proxy for corruption, was among the six among six of the independent variables that displayed substantial multicollinearity. Other such variables are the proxy for trade openness (OPEN), annual population growth (LABOR), gross capital formation (CAPITAL), total external national debt (DEBT), and credit to the private sector (CREDIT). For these independent variables, their *Tolerance statistic* was below 0.20 and the *variance inflation factor (VIF) statistic* was above 5.0. For these reasons, I eliminated the variables from the regression analysis.

Ways That the Findings Confirm, Disconfirm, or Extend Knowledge

The current study provided confirmation for most of the findings in the literature. The study first confirmed that any privatization program with a large dose of FDI is likely to

contribute significantly to economic growth. In its definition of privatization proceeds, the study used an expanded definition of privatization to include all inflows brought about by the privatization of the ports. This definition captured not only the net proceeds of privatization received by the government, but also the postprivatization investments by the concessionaire in the form of facility renovation and upgrade, technology, innovation, management, and manpower. The study results indicate that privatization has made a positive and significant contribution to both short and long-term economic growth in Nigeria.

Based on the results of the study, the linear combination of cargo throughput, privatization proceeds, inflation rate, deregulation index, and interest rate accounted for approximately 83% and 92% respectively of the variations in GDP Growth, and GDP per capita growthð the indicators of short and long-term economic growth respectively. The study also confirmed cargo throughput as the means through which the privatization program transmitted growth to the economy, although privatization proceeds was statistically significant as a predictor of economic growth indices.

Second, the finding from the study agrees with the view in the literature that the presence of strong institutions, market structures and strong competition in a country tends to enlarge the effect privatization (Plane, 1997). This study used the ñdistance to frontier scoreò as a proxy for the effects of deregulation (DEG) in the economy to represent institutional variables (Jayasuriya, 2011). The ñdistance to frontier scoreò was developed by the World Bank for ranking countries in its ease-of-doing-business index. This measure shows the distance of each economy to the best performance observed on each of the indicators across all economies (Frontier) in the Doing

Business sample since 2005. The index provides a measure of the extent and efficiency of regulations in the economy regarding procedures, time, and cost as they affect small and medium-sized enterprises operating in the largest business city of an economy. It is a multi-dimensional index comprising variables that measure the efficiency of starting a business, dealing with construction permits, getting electricity, and registering property. Other components include availability of credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts. The scale for measuring an economyôs distance to frontier is from 0 to 100, where 0 represents the lowest performance and 100, the highest. In the growth model used in the study analysis, the coefficient of DEG was positive and statistically significant. The implication of this finding is (a) reforms in the area of deregulation have started to yield fruits in Nigeria; (b) deregulation is a significant factor in determining economic growth in Nigeria; and (c) the presence of strong regulations in Nigeria provided an impetus to the privatization process. These results, therefore, confirms in part, that the success of any privatization program is contextual and cannot happen to the exclusion of other policy initiatives.

Other institutional factors included in the growth model used in this study are OPEN and GOV. While OPEN is a proxy for trade liberalization, GOV is an index of corruption. In the study, OPEN is the ratio of exports and imports to GDP (Barro, 1989; Calderón & Servén, 2010). The variable GOV is the ratio of government consumption to GDP as an indication of political corruption and bad government. The study dropped both variables in the growth regression model due to the presence of substantial multicollinearity. It is, therefore, difficult to support the assertion in the literature that trade liberalization enhances privatization. Rodrik (2006), in his

seminal paper on the broad strategic lessons on economic growth from the observed growth experience of diverse countries over the past 50 years, found that long-term economic growth declined in countries that implemented trade liberalization. It is also difficult to determine the effect of government-induced corruption on economic.

The finding from the study departed significantly from the results of Cook and Uchida (2003) and similar studies, which found a robust negative correlation between privatization and economic growth in developing countries. According to Filipovic (2005), the reason for this divergence could be as a result of a problem with the Cook and Uchida (2003) model. Another reason may be in the definition of privatization proceeds. While Cook and Uchida used the ñproceeds from privatizationò as the definition of privatization, this study employed an expanded definition of privatization proceeds.

Privatization, productivity, and efficiency gains at the firm level. A significant proportion of existing studies on privatization focused on the efficiency gains of privatization at the level of the privatized companies (Megginson & Netter, 2001). These studies emphasized the impact of postprivatization on output, profitability, investment and efficiency gains at the microeconomic level (Abdou & Moshiri, 2009). Megginson and Netter (2001) reviewed 70 of such studies including Boubakri and Cosset (1998), DôSouza and Megginson (1999), and Dewenter and Malatesta (2001), all cited in Megginson and Netter (2001). Except for a handful of studies that concluded otherwise, most of these cross-country studies found that the privatization policy does lead to improvement in productivity, operating and financial performance, reduction in inefficiency, and increase in investment at the level of the divested

firms (Megginson & Sutter, 2006). The studies also recorded significant decline in financial leverage.

These empirical studies on efficiency effect of privatization employed different methodologies, and the type and quality of data used in these studies vary widely (Megginson & Netter, 2001). The validity of these studies, therefore, is limited by the multiplicity of methodologies employed, availability and consistency of data, and the possibility of sampling bias. The subject will require further empirical studies to address the issue regarding the exact causes of improvements and distributional effects of privatization (Filipovic, 2005; Megginson and Netter, 2001).

The current study provided an avenue for confirming or disconfirming the findings from these studies. A productivity efficiency assessment using the Malmquist TFP technique, which identifies the set of best practice observations for which no other firm can produce as much or more of every output given the inputs, revealed a mean TFP Index of 1.057 over 2007 and 2014. The result, thus, confirmed that there has been an overall improvement in both productivity and efficiency at the ports following privatization. It also showed that the ports recorded productivity and efficiency improvements, although marginally in all the years except for 2008 and 2011. The analysis additionally revealed that the recorded efficiency improvements were in the areas of technical efficiency change (TECHCH) and pure technical efficiency change (PECH). The direct implication of this result is that the improvements arose primarily as a result of changes in innovation, production processes and management technique, together with the concessionaireôs

capacity to manage its resources and to adapt to the new private sector-driven environmental conditions.

The study, thus, provides additional support to the works of earlier researchers on the effect of privatization on improvement in productivity, operating and financial performance, reduction in inefficiency, and increase in investment at the level of the divested firms.

Property rights theory, institutions, and privatization. Property rights theory offer the proposition that the transfer of property rights from the public to private investors creates the incentive for the latter to make the additional investments necessary to induce increased efficiency, higher productivity, and ultimately increased shareholderôs wealth (De Soto, 1993). Empirical evidence exists to support this proposition. In his assessment of the effectiveness of privatization as a policy option for promoting economic growth, Filipovic (2005) found that the property rights transferred through the implementation of the privatization policy create a strong incentive for investors to invest in productivity and efficiency improvements. Privatization also encourages wider ownership, and increases the incentive to pursue longer term goals.

This study examined these propositions and tested the neoliberal theory that the wholesale liberalization of the economy in the form of private ownership of state assets such as the seaports is a significant predictor of economic growth. Four of the components of the ñdistance to frontier scoreò, namely dealing with construction permits and other permits, registering property, protecting minority investors, and enforcing contracts are all essential elements of property rights. The fact that the coefficient of DEG is positive and significance is a pointer that (a) there has been quite some progress in strengthening property rights in Nigeria;

and (b) property rights plays both a direct and enabling role in ensuring the success of a privatization program.

Research designs for efficiency gains. Research designs for efficiency gains in existing literature fall into two broad categories, namely parametric and nonparametric approaches (De Borger et al., 1994). Traditional models of the parametric and the nonparametric methods are respectively the SPF and the DEA. (Greeen (1997) cited in Porcelli (2009), described SPF as "the frontier production function is an extension of the familiar regression model based on the microeconomic premise that a production function represents some ideal, the maximum output attainable given a set of inputs" (p. 16). Studies, including Cullinane & Song (2006), Estache et al. (2002), Hung et al. (2010), and Tongzon and Heng (2005), all use the SPF or variants in their designs. All the studies measured changes in berth capacity, technology, labor, and cargo throughput before and after the privatization. The DEA, which also optimizes output based on a given set of inputs, is more popular with empirics of efficiency gains in specialized containerized ports Cullinane and Wang (2006) cited in Hung et al. (2010).

This study used the output-based Malmquist TFP index to provide an answer to the first research subquestion and the correlational research design and the multiple regression analysis. The Malmquist-TPF index, a DEA technique for analysis productivity changes in panel data, measures the total productivity variations at the ports and also decomposed the total productivity changes into its technical and technical productivity components (Cullinane & Wang, 2006 cited in Hung et al., 2010). Tongzon and Heng (2005), Cullinane et al. (2005), Hung et al. (2010), and Wu and Goh (2010) equally used the DEA to estimate efficiency coefficient of ports.

Research designs for determining the economic impact of privatization. The correlational research design and the multiple regression analysis used in this study derives primarily from the studies by Kessy (2008), Kirikal (2005), and Varmaghani et al. (2014), who used the TFP index derived from a DEA-Malmquist analysis as input into a Cobb-Douglas type growth model to determine the sectoral impact on economic growth. These and other similar studies provided the framework and main analytical tools for the study. The study used the multiple regression analysis to predict the level of economic growth productivity induced by the privatization exercise; determine the extent of the relationship between the dependent and independent variables; and control for the covariates likely to provide alternative explanations for the predicted relationship between the dependent and independent variables.

How the Current Study Benefited From This Framework

In the present study, the theoretical and analytical frameworks discussed in this chapter provided the theory and the analytical tools for the study. The property rights theory provided the theoretical framework while the Malmquist TPF index, together with the growth models used in the frameworks, guided the analyses. Property rights theory offer the proposition that the transfer of property rights from the public to private investors incentivizes the latter to invest in the privatized SOE (De Soto, 1993). The Malmquist index provided the technique for evaluating the efficiency gains of privatization at the firm level. Although scholars are yet to agree on the nature of the relationship between privatization and economic growth, empirical studies reveal a causal relationship between privatization and efficiency in economies with well-developed institutions and markets structures. The quality of institutions within a country correlates

strongly with economic development and determines whether development takes place in the first instance (Boardman & Vining, 1989; Sheshinski & López-Calva, 2003, cited in Cavaliere & Scabrosetti, 2008; Vickers & Yarrow, 1991).

Choice of Research Design and Data Analysis

This study used the output-based Malmquist TPF index to provide an answer to the first research subquestion and the correlational research design and the multiple regression analysis in assessing the impact of the productivity improvements at the ports on economic growth following privatization. In this study, these are some structural limitations that restricted the choice of a research approach to the study to nonexperimental and the design to correlational studies. First, as the privatization intervention by the government has already taken place, it was not possible to it will not be possible to select, manipulate and control the associated variables necessary to establish a causal relationship between the variables (Lord, 1973). The already completed privatization exercise also made it impracticable to have control groups. In the same vein, it was also not practicable to establish a temporal precedence between causes and effects as the intervention is post ante. In addition to the above design limitations, there are two other limitations of the correlational design. These are the direction of control and third variable problems. In the literature, the statistical procedures for addressing these limitations are the time-lagged correlational design and the partial correlation analysis for dealing with the problems of directionality the third variable problem. The study, therefore settled for the correlational design with statistical controls.

As regards the assessment of the impact of privatization on the efficiency and productivity of the ports, the appropriate approach depends on whether the evaluation relates to a single port or multiple ports system. For a single port system, the traditional approach to evaluation is through the engineering single-port methodology, which compares the actual throughput of the port with the maximum throughput the port can physically handle or optimum throughput (Talley, 2006). The performance of a port has improved where its actual throughput tends towards the optimum throughput over time. On the other hand, when the performance of the ports moves away from the optimum throughput, the portôs performance has deteriorated. A direct comparison of a portôs actual performance indicators to standard provides an additional method of port evaluation under the single-port approach (Talley, 2006).

The evaluation of multi-port performance, on the other hand, is more complex due to the multifaceted nature of the business of the ports. This complexity makes a direct comparison among apparently homogeneous ports appear inappropriate and misleading. As each port terminal differs from the other regarding location, policy, service, operational and intermodal characteristics and variables that have a significant influence on the result of the comparison. Such holistic frontier statistical models as the DEA and SPF provides ready tool for analysis. The frontier statistical models assess whether the throughputs of the ports are the maximum ever possible given level of inputs (Culliane et al., 2004; Culliane et al., 2002, cited in Esmer, 2008). Whereas the SPF requires large samples in its analysis, the DEA supports both large and small samples and is more popular with empirics of efficiency gains in specialized containerized ports (Kessy, 2008). As the sample for the study is rather small, the study settled for the DEA. The

DEA also optimizes output based on a given set of inputs (Cullinane & Wang, 2006) cited in Hung et al. (2010). The study also employed the Malmquist (TPF) technique to accommodate the use of panel data. The use of panel data enables the observation of a cross section of data over time, thereby allowing for both a dynamic as well as the cross-sectional analysis of the problem (Frees, 2004).

Choice of Study Variables

The dilemma faced by most growth empirics is that growth theories do not provide any guidance on variables to include in any growth study (Boubakri et al., 2009). There are as many variables or a combination of variable relating to growth as there are empirics. Levine and Renelt (1992) cited in Boubakri et al. (1992) observed that the researchers found over 50 variables that significantly correlated with growth in a single study. Cook and Uchida (2003) used the proxy for trade liberalization (openness), FDI, political stability, inflation, government consumption and public debt in their growth regression. Other variables they used included liquid liabilities as a proxy for financial sector development, budget deficit or surplus, GDP growth per capita and population. In a similar study, Filipovic (2005) used per capita growth to regress against the privatization proceeds in 94 countries and arrived at some useful conclusions. He used a total of 18 variables including initial GDP per capita growth rate, GDP in the initial year, average population growth rate, the ratio of government consumption to GDP, total savings as a percentage of GDP, gross secondary school enrollment ratio and inflation of consumer prices. Filipovic (2005) also included government budget balance as a percentage of GDP, total national debt as a percentage of GDP, aid for development per capita measured in US Dollar in year and

privatization proceeds as a share of GDP and FDI as a percentage of GDP in his model. The variables used by Abdou and Moshiri (2009) and Al-Obaidan (2002) in their studies were the ratio of investment to GDP, the growth rate of real GDP, per capita income, credit to the private sector as a percentage of GDP and the real interest rate. Other variables are the ratio of public investment to GDP, percentage change in GDP deflator, the ratio of external debt service payments to exports of goods and services, the ratio of external debt to GDP, the terms of trade and privatization revenue as a share of GDP.

Having taken cognizance of the choice of variable by similar studies and the particular context of the current study, this study settled for the total efficiency index, deregulation, trade openness as the proxy for trade liberalization; government consumption to GDP; and credit to the private sector as a percentage of GDP. Other variables are the real interest rate interest; total national debt as a percentage of GDP; the inflation rate; and annual population growth as proxy for labor. The other variables included are gross capital formation, total volume inward and outward bound cargo (cargo throughput), and PVA privatization proceeds. The privatization proceeds included all postprivatization investments by the concessionaire in the form of facility renovation and upgrade, technology, innovation, management, and manpower.

Analysis and Interpretation of the Findings

This study set out to determine whether the variations in efficiency and productivity that accompanied the privatization of the ports in Nigeria could provide some explanations for the further changes in the countryôs economic growth after the privatization exercise. As economic theory predicts that the property rights conferred by way of privatization incentivizes the private

sector to make greater investment in the divested entity, the first task before the study is to determine whether the postprivatization investment made by the concessionaires resulted in increased productivity and efficiency at the ports. The postprivatization investments were on facility upgrades and improvements, changes in technology, management, innovation and the like. The second task was to determine whether the changes in the productivity and efficiency at the posts following privatization resulted in further changes in the GDP, GDP growth, GDP per capita, and GDP per capita growth in the Nigerian economy.

The analyses of the productivity and efficiency at the ports following the privatization of the ports revealed that first there had been an overall improvement in productivity and efficiency at the ports that accompanied the privatization. Second, the ports recorded modest productivity and efficiency improvements in all the years the following privatization except for 2007 and 2011. Last, the recorded efficiency improvements were in the areas of technical efficiency change and pure technical efficiency change.

Implications for port productivity and efficiency. The Malmquist measures the overall change of productivity in organizations over time and further decomposes the change into its various sources, namely efficiency change, technical efficiency change, pure technical efficiency change, scale efficiency change, and total factor productivity change. The Malmquist TPF index indicates the maximum output feasibly obtainable from a given set of factors and technological status. It shows the frontier that limits a firm's productive potential, and beyond which a firm is incapable or producing, given the state of current technology in a given period. When a firm or industry experiences technical change, there is a shift in productivity towards the frontier. A firm

or industry has experienced a technological change when the frontier of production shifts away from the state of current technology in a given period. Technological change, therefore, signifies improvements in efficiency arising from changes in existing technology (Avkiran, 2006; Díaz-Hernández, Martínez-Budría, & Jara-Díaz, 2008).

The results of the Malmquist TPF index analysis indicates that over the period 2007 to 2014, the maritime industry experienced a positive productivity change towards the industryôs productivity frontier. Some firms exceeded the industryôs frontier while others did not (Table 7). Only four firms were still operating below the overall industrial average by 2014. The result also indicates that, on the average, the source of the improvements in efficiency in the industry does not include improvements in scale of operations arising from a change in the status of technology over the period. Rather, the sources of the recorded efficiency improvement were in the areas of technical efficiency change and pure technical change. The implication is the improvements arose largely as a result of changes in innovation, production processes and management technique, together with concessionaireôs capacity to manage its resources and to adapt to the new private sector-driven environmental conditions.

Implications for economic growth. The growth regression indicated that first, the productivity increase at the ports had statistical significance on the all the indices of economic growth both in the short-term (GDP growth) and in the long-term (GDP per capita growth). Second, the linear combination of interest rate, inflation rate, deregulation, privatization proceeds, and cargo throughput was significantly related to and accounted for approximately 54%, 83%, 61% and 84% respectfully of the variation in GDP, GDP growth, GDP per capita,

and GDP per capita growth in Nigeria. Third, the mechanism through which the privatization program influenced economic growth was through increased cargo throughput; and the influence of recorded efficiency improvement on the economic growth indices was not statistically significant; Fourth, surprisingly and against the prescriptions of economic theory, the postprivatization proceeds is not one of the channels through which the privatization policy transmitted growth to the Nigerian economy although it was statistically significant as a predictor of economic growth indices; Fifth, although interest rate was statistically significant as a predictor of economic growth, its coefficient was negative; Sixth, the analyses established a cause-effect relationship between the dependent and predictor variables.

Seaports, like all key transport infrastructure, plays a major role in any economy. First, they allow for cargo and passenger berthing and handling, provide bunkering and repair services to ships, and provide shelter to ships from the heavy sea and stormy conditions. Seaports also provide the platform for industrialization and serves as a vital link in the transportation value chain (Branch, 1986, cited in Esmar, 2008). Additionally, seaports provide a spectrum of gateway and terminal services including pilotage; dredging and maintenance of navigational channels; berthing; loading and offloading of cargo, and the port services; and the like (Jaja, 2009). For a monoculture economy such as Nigeriaôs with its heavy dependence on the export of oil and imports of goods, the seaports provide a key gateway to the country and access foreign exchange. In Nigeria, the seaports currently account for over 96% of physical carriage of Nigeriaôs oil and nonoil trade (Ekong, 1981, cited in Jaja, 2009). Furthermore, ports provide transit storage for goods pending regulatory action by inspection agents, customs and other law

enforcement, and government agencies that lawfully derive their revenues (Carrodano, 2009). Moreover, the ports create employment to forwarding and clearing agents, stevedoring agents, maritime operators, insurance, haulage, and other value-added activities associated with the ports (Carrodano, 2009, Jaja, 2009).

Beyond their traditional roles as the gateway to international trade, seaports act as a driver of economic development, a border control, a logistics hub and an important node in the international trade value chain. As a primary entry and exit point into the country, seaports provide the platform for ensuring the safety of the nation and its people through the monitoring the passage of goods and humans by the security and other government agencies. In this sense, ports serve a platform for minimizing potential conditions that will affect the safety of the nation and its people at risk (Quansah, 2014).

However, these real and potential benefits of the seaports had very slim opportunities for expression in Nigeria before the privatization exercise. Before the exercise in 2006, the productivity and other performance indices at the ports were at their lowest ebbs (Ndikom, 2013). The results of the study provide empirical evidence that the privatization exercise provided the stimulus for the country to exploit the real and potential benefits of seaports. Table 19 below shows the trend in key growth variables in Nigeria between 1995 and 2014.

Table 19 clearly shows that the years following the ports privatization (2005 ï 2013) witnessed a dramatic rise in the FDI. Whereas the average FDI received by the country between the years 1995 and 2004 was $1.44 billion, the average FDI received by the country in the postprivatization years between 2005 and 2013 was $6.82, reflecting an increase of about 374%.

In the same vein the GDP per capita, which was $645.9 at the end of 2004, was $3005.5, reflecting a 366% increase over the period.

Table 19

Nigeria Key Economic Performance Indicators Prior to Privatization (1995-2005)

Year	GDP ($bn)	GDP per capita ($)	GDP growth (%)	FDI ($bn)
1995	28.55	263.30	-0.30	1.08
1996	34.99	314.70	5.00	1.59
1997	35.82	314.30	2.80	1.54
1998	32.00	273.90	2.70	1.05
1999	35.87	299.30	0.50	1.00
2000	46.39	377.50	5.30	1.14
2001	44.14	350.30	4.40	1.19
2002	59.12	457.50	3.80	1.87
2003	67.65	510.40	10.40	2.01
2004	87.85	645.90	33.70	1.87
2005	112.29	804.20	3.40	4.98
2006	145.43	2024.80	8.20	4.85
2007	166.45	1130.90	6.80	6.03
2008	209.06	1376.00	6.30	8.20
2009	169.48	1090.70	6.90	8.55
2010	369.06	2310.90	7.80	6.05
2011	411.74	2507.70	4.90	8.84
2012	462.06	2742.20	4.30	7.10
2013	521.80	3005.50	5.40	6.74

Note. From World Bank Indicators (2015). Retrieved 29th September 2016 from http://data.worldbank.org/products/wdi.

This trend aligns closely with empirical evidence from the literature. Empirical evidence shows a close, if not causal association between port development and a countryôs economic growth. In their study of the effects of the improvement of port logistics on economic growth in the Zhejiang Province in China, Huang and Peng (2014) found that the logistics industry in Zhejiang Province is one of the most important factors influencing economic development. Liu

and Li (2007) also found reciprocal causation between developments in the logistics industry and economic growth. This view also received support from such studies as Shao and Zheng (2011), and Shao (2007) cited in Huang and Peng (2014).

Limitations of the Study

Limitations to Generalizability and Trustworthiness

To maintain the highest level of empirical proof and validity, a quantitative study must incorporate the characteristics of comparison, manipulation, control, and generalizability into its design. The feature of generalization determines the extendibility of research finding. It reflects the ability of a study to confirm causality to the exclusion of other rival variables and makes it possible to generalize the research findings (Frankfort-Nachmias & Nachmias, 2008).

In the study, the privatization intervention by the government has already taken place. It is therefore not possible to have pretest scores of the variables or to manipulate the variable during the experiment. The government also privatized all the ports simultaneously making it impracticable to have control groups. Furthermore, it was also not practicable to establish a temporal precedence between causes and effects as the intervention is post ante. Due to these structural limitations, the approach to the study is nonexperimental, and the design is correlational, using statistical controls.

Campbell and Stanley (1963) described the correlational design or ex-post facto design as the minimum reference point for any design for good reasons. Unlike the pure experiment that involves the comparison and recording of differences and contrasts, the correlational design involves studying one single group after an event has occurred. Thus, the design lacks the control

of the independent variable or variables. With the design, it is also not possible to ascertain that the selected variables for the study are the most relevant variables in the event. Additionally, it is not possible to determine with any certainty whether the causative factor has been included or even identified, thus exposing the study to the possibility of multiple and even contradictory hypotheses. For that reason, it may not be possible to disconfirm any hypothesis. Taking cognizance of these limitations of the correlational studies, this study used the time-lagged correlational design or cross-lagged panel correlation to address the problems of directionality and partial correlation analysis address the third variable problem. That way, the study not only eliminated the possibility of third variables, but also established causality between the indices of economic growth and the independent variables. Additionally, the study determined the mechanism through which the privatization exerts influence on the growth indices in Nigeria. These outcomes clearly establish the generalizability of the results of the findings, although there are other limitations that dictate caution with the interpretation of the results.

First, the Cobb-Douglas production function used in the analysis has a number of limitations. The generalized function includes only two factors while neglecting other inputs. Although it is possible to extend the model to include more than two factors in the modified model as this study did, such inclusion violates the assumption of the constant returns to scale. Next, the assumption of the constant returns to scale flies in the face of empirical evidence to the contrary (Bang-Yen, 2011). Also, the measurement of capital in a Cobb-Douglas production function only takes the quantity of capital available for production into account. Furthermore, the perfect competition assumption by the Cobb-Douglas production function is somewhat

unrealistic. In addition, while the model is simple to apply, it may not reflect the reality in all industries. Moreover, the function does not take the complementarity of factors in its analysis while recognizing the substitutability of factors. Due to these limitations, the function may not provide proper and correct economic implication.

Second, some other assumptions of the study introduced some design and methodological limitations. Ports are a very complex business that handles many different types of goods. For this reason, the total factor productivity score determined through the Malmquist TFP analysis and used in the growth model regression, depended on the appropriateness of the inputs and outputs variables that the study used. The variable nature of data within the different categories of input increases the variability of the possible results. Aside from the complexity of port operations and choice of variables, there are also the assumptions of a fixed relationship between labor and equipment, together with the assumption of constant returns to scale in the Cobb-Douglas functions. These assumptions placed some limitations on the interpretation of the results of the study by researcher.

Last, the study also used secondary data for the analysis whose primary limitation is that the data was not specifically collected with this particular study in mind. For that reason, the data may contain errors and discrepancies. While the study used the triangulation of information with data from the IMO, Annul Digest of trade and those of the CBN to verify the integrity of secondary data, it may not completely eliminate errors and discrepancies.

Limitations to Validity

There are certain features of this study that exposed it to possible threats to validity. First, there are the challenges with correlational design addressed in the previous section, which limits the ability to confirm or disconfirm causality to the exclusion of other rival variables and makes it possible to generalize the research findings. While the correlational design may not have an inbuilt design controls, there are some statistical techniques that provide the tools for addressing the dual challenges of directionality and third variables inherent in the design. This study used the time-lagged correlational design, or cross-lagged panel correlation to address the problem of directionality.

To confirm the independence of residuals or the absence of serial correlation, a condition for validity of the results of a multiple panel regression analysis, the study used the *First Differenced Method* to correct any serial correlation by first converting all the variables in the dataset into *first differenced data*. Further multiple regression analysis of the differenced dataset through the origin without an intercept, revealed a Durbin-Watson statistic of 2.0, which confirmed the independence of the residuals (Augustyniak, Liker, & Duncan, 1985b).

Limitations to Reliability

Reliability involves the consistency, or reproducibility of test scores. That is, the degree to which one can expect relatively constant deviation scores of individuals across testing situations on the same or parallel, testing instruments. This property is not a stagnant function of the test. Rather, reliability estimates change with different populations (i.e. population samples)

and as a function of the error involved (Fairchild, 2002). Internal consistency, in particular, determines the extent to which tests or procedures assess the same characteristic, skill or quality.

Apart from determining the effect of the postprivatization investment on productive efficiency of the ports after privatization, the study assessed the extent to which the postprivatization productive efficiency of the ports predict changes across four economic growth indices namely, GDP, GDP growth, GDP per capita, and GDP per capita growth. The study exhibited a consistency between the result of the regression of privatization, together with other independent variables and GDP, GDP growth, GDP per capita, and GDP per capita growth.

Recommendations

Recommendations for Further Research

One important outcome of this study is that privatization has a positive impact on the sectoral efficiency and productivity, together with economic growth in the short and long terms when privatization empirics use the broad definition of privatization proceeds in their analysis. The obvious conclusion here is the contradictory and inconclusive outcomes of previous privatization studies to the limitations observed in Megginson and Netter (2001). In their study, Megginson and Netter suggested that almost all the studies they reviewed covered very short periods of between 5 and10 years. The studies also used different designs and methodologies, with varying degrees of validity and reliability. Besides, there is a wide variation in the quality of data used in the studies. Apart from the fact that most of the studies were cross-country analysis, they paid scant attention to the efficiency impact of privatization at the sectoral and firm levels. Other areas of privatization that recorded very few studies were the impact of the privatization

methods on outcomes; the theoretical conditions that distinguish more effective privatization programs from less effective ones; and the effects of privatization on income distribution, cost of living, employment and other social impacts of privatization.

The second important outcome of the study is that since the study established a causal relationship between economic growth and privatization, one can now justify more in-depth empirical analysis of the effectiveness of privatization policy, allocative and employment effects. In the same vein, one can also justify further studies to determine whether the privatization of the ports did achieve its stated objectives. These objectives include a reduction in the allocations from the national budget daily ports operations; increased revenue generation for the government; complete restructuring of the maritime subsector; and deepening the countryôs capital market.

Another area that would require further research is the determinants of privatization success. According to Plane (1997), the ability of a country to strengthen institutions, create a transparent environment and promote appropriate internal policies combines with other policy reforms to ensure the success of privatization (Plane, 1997). It thus follows that the success of any privatization program is contextual and cannot happen to the exclusion of other policy initiative that support institution building. The context includes the presence of adequate human capital, improvement of human capital and increases in human capital per person (Barro, 1991). The findings from this study align with this view of the critical role of institutions in the success of privatization programs. However, the studyôs selection of institutional variables does not include presence of adequate human capital, improvement of human capital and the efficient use

of human capita in analysis due to the dearth of reliable data. This limitation presents an opportunity for further empirical investigation.

Implications of study

Potential impact of positive social change at the societal/policy level

The ultimate objective of the policy is to effect some social change. A review of existing literature reveals five strands of studies relating to privatization. According to Bernerth (2004), the elements of social change include are scholarship, systemic thinking, reflection, practice, collaboration, advocacy, civic engagement, and humane ethics. The study under consideration combined two threads of privatization studies, namely the efficiency and productivity impact at the level of the privatized firm, and studies on economic impact at the macroeconomic level. Rather than emphasize the ethics feature of social change, the focus of this study was on the ñpracticeò characteristic. The intention of the ñpracticeò characteristic of social change is to construct or deconstruct the theoretical understanding of a phenomenon, using reality borne out of the everyday practical experience. While a deconstruction may induce a shift in the legislative policy as it relates to privatization and other policies, confirmation of the positive effects of the privatization policy may incentivize in policymakers in providing additional support to both the privatization, and deregulation programs and extending the program to other sectors of the economy (Bernerth, 2004). The policy of trade liberalization (OPEN as a proxy), had a negative influence on the economic growth indices and will require a closer scrutiny before further implementation.

Second, by embarking on the ports privatization, the government intended to affect a number of social changes that would have positive effects on the society in the areas of GDP per capita growth, income, employment, productivity, profits and market growth. These include, but not limited to increasing overall economic growth and growth per capita, increasing the efficiency of economic units and by so doing increase the overall living standards of the society. By confirming the nexus between privatization and the economic growth indices, the study provided support for the efficacy of neoliberal economic tools such as privatization and deregulation on long-term economic growth.

Methodological, theoretical, and empirical implications of study

The study used the DEA linear programming model to construct the total factor productivity index of the ports using longitudinal data; and further used the multivariate analysis to determine the impact of the productivity improvements at the ports on economic growth based on the values of the independent, intervening and control variables. The application of linear programming techniques in evaluating the efficiency and productivity gains of policy changes at the ports is not new (Hung et al., 2010; Cheon, Dowall, & Song, 2010, Ghani, Ohta, & Yusoff, 2003). Likewise, most economic growth empirics have used the multiple regression and other quantitative analytical techniques in determining the economic impact of the privatization policy (Abdou & Moshiri, 2009; Al-Obaidan, 2002; Cook & Uchida, 2003; Filipovic, 2005). Equally, scholars have been using the Malmquist TFP index as an input in the growth regression to convey the sectoral impact of policy on economic growth (Kessy, 2008; Cullinane et al., 2005;

Hung, Lu, and Wang, 2010; Wu and Goh, 2010) equally used the DEA to estimate efficiency coefficient of ports.

However, this study used the correlational research design and the multiple regressions in its analysis. The study further used the time-lagged correlational design to determine the exact direction of control and the partial correlation analysis to resolve the challenge of the intervening variables. This procedure, together with the use of multiple regression analysis resolved (a) the two major limitations of the correlational design, and (b) resolved the validity issues in previous port privatization studies in Nigeria that did not control for the effects of covariates.

The results presented in this study, therefore, introduced a useful basis for future research in the field of productivity, efficiency, the maritime sector, and indeed all the sectors of the economy. It also provides a basis future work on the relationship between the parametric, and nonparametric measures of productivity and efficiency, and how they will assist performance measures and management decisions. Second, by using the time-lagged correlational design to determine the exact direction of control and the partial correlation analysis to resolve the challenge of the intervening variables, the study eliminated the major constraints that limited the ability of correlational studies in establishing a causal relationship between dependent and predictor variable.

Recommendations for Practice

Understanding the economic effects of policy has been a priority of policymakers in government. The focus of this study is to provide additional evidence for the Nigerian government to make policy decisions. It also had an added focus on providing additional

evidence on the efficacy of the privatization and related policy, before government embarks on major policy shifts that are likely to affect the economic structure, resource allocation and employment in the economy in a fundamental way.

Based on the findings from the study, deregulation (DEG) as a predictor of the economic growth indices, used as a proxy for institutional factors, was positive and statistically significant. However, the above construct of DEG does not include an important concept of institutional factors, namely the ñlegal infrastructure.ò Chang (2002) argued that the existence of ñlegal infrastructureò allows market participants to exercise property rights (p. 10), and defined who holds what property rights, who participated in what kinds of exchange in the marketplace, the legitimate object of exchanges, acceptable conducts in the marketplace, together with the terms of the exchanges. The legal, institutional, and regulatory frameworks usually embody these institutional factors. It is instructive that these institutional factors are lacking in the privatization of ports. As it were, the government is yet to pass the Ports and Habor Bill (2007), which provided the basis for the privatization of the ports. The Ports and Habor Bill (2007), when enacted into law, will provide for the legal framework for the creation of a National Ports and Harbor Authority that will perform the regulatory functions of the ports and harbor operations in Nigeria (Idornigie, n.d.). This important institution has not been in existence since the privatization and creates a lacuna, which has limited the effectiveness of the privatized ports and stymied the growth of the maritime sector along lines the stated objectives of port privatization. Adi, Ndukwe, Iheanachor, and Dim (2013) alluded to the lapse when the researchers concluded that ñunless reform provides the entire institutional and regulatory frameworks necessary for the

competitive enterprise of the private sector, efficiency goals may not be achievedò (p. 133). This fact, probably accounted for the very modest efficiency performance of the ports as revealed by the mean Malmquist TFP index of 1.057. It may also explain the nonsignificance of the portsô efficiency in the growth model.

Conclusion

Theories of growth have engaged the minds of scholars even in ancient times. There are as many theories and schools of thought as there are scholars. Over the past 50 years, scholars have proffered my concepts as panaceas for economic growth. Scholar have proposed such universal remedies such as the growth in per-capita income, capital-markets development, physical-capital accumulation, rapid human-capital development, low-income inequality, low government participation, deregulation, trade liberalization, and the like (Wacziarg, 2002). The privatization policy is one of such proposed panaceas for economic growth. The key economic theory that underlines the privatization policy is the property rights theory. Adherents to this policy believe that the absence of clearly defined and well-protected property rights in any society makes it difficult for investors to justify an investment in a SOE. It is the formal property rights that assure investors of the security of their investment under privatization (De Soto, 1993).

Since the privatization policy took center stage in the economic lexicon in early 1980, there have been numerous studies on the effect of the policy on output, profitability, investment and efficiency gains at the microeconomic level. While existing literature appear settled on the impact of privatization on growth in advanced market-driven economies, there is scant empirical

literature about the effects in developing countries. The measly literature that exists presented conflicting conclusion. This development may be due in part to differences in design, methodology, reliability of existing data, etc. The intention of this study is to help fill that gap in the literature.

This study tested the proposition that the presence of property rights incentivizes the private sector into investing in an SOE. When we use the expanded definition of privatization proceeds, which captured all inflows brought about by the private sector in the form of facility renovation and upgrade, technology, innovation, management, and manpower following the privatization exercise, the findings from the study provide support for this proposition. More specifically, the study provides support for the propositions that (a) privatization leads to increased efficiency and productivity at the level of the privatized firm; (b) privatization engenders growth in both the short and long-term economic wellbeing of a country; (c) deregulation of the economy, used as a proxy for institutional factors, enhances the gains from privatization; and (d) trade liberalization has a negative impact on economic growth indices when pursued alongside privatization.

It is noteworthy that the results of the study support the view that the development of instructional factors is critical to the success of policy prescriptions such as privatization policy. In Nigeria, based on the outcome of the study, deregulation was positive and statistically significant in the model despite the absence of some critical institutional factors such as the legal, institutional and regulatory framework for the privatization of and postprivatization regulation of the posts. This deficiency in the portsôprivatization framework, probably accounted for the

modest efficiency gains recorded at the ports following the privatization, as revealed by the study. Now is the time for the government to harness the full benefits of the privatization exercise by enacting the necessary laws and establishing the key institutions for a proper management of the ports.

One important social impact of this study is that policymakers, now armed with the empirical evidence from the study, will be reassured of the wisdom in their choice of the privatization policy. Besides providing information to the policymaking value chain in Nigeria, other important themes that are likely to emerge from this study include the construction or deconstruction of the theoretical basis for the privatization instrument for purposes of triggering legislative changes or policy reform with the potential for large-scale transformation of the society.

The results are also likely to provide the impetus for additional studies particularly on the effects of privatization and similar market-oriented policies on developing economies, leading to the advancement of knowledge in economic growth. Apart from the contributing to existing literature on privatization, the study also opened up possible areas for more in-depth empirical investigations in the future. These include the theoretical conditions that distinguish more effective privatization programs from less effective ones; the sustainability of the gains of privatization long after the implementation of the privatization program, and the effects of privatization on income distribution, cost of living, employment and other social impact of privatization. Other areas include the impact of the privatization policy the national budget,

revenue generation for the government, restructuring of the maritime subsector, and deepening the countryôs capital market.

References

Abdou, A., & Moshiri, S. (2009). Privatization and capital formation in developing countries: an empirical analysis. *International Review of Applied Economics*, *23*(5), 557ï 575. https://doi.org/10.1080/02692170903007557.

Adi, B., Ndukwe, E., Iheanachor, N., & Dim, C. (2013). Do privatisation model, contractual and institutional factors play any role in infrastructure post-privatisation efficiency? Exploring port concessions in Nigeria. *Journal of Infrastructure Development*, *5*(2), 121ï 135.

African Development Bank, Organisation for Economic Co-operation and Development, United Nations Development Program (2015). *African Economic Outlook*. Retrieved from http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2015/PDF_Chapters/Overview_AEO2015_EN-web.pdf.

Alchian, A. A. (1965). Some economics of property rights. *Il Politico*, *30*(4), 816ï 829.

Al-Obaidan, A. M. (2002). Efficiency effect of privatization in the developing countries. *Applied Economics*, *34*(1), 111ï 117. https://doi.org/10.1080/00036840010007948.

Apapa Bulk Terminal Limited. (2016). Retrieved August 6, 2016, from https://www.fmnplc.com.

APM Terminals Limited. (2016). Retrieved August 6, 2016, from https://www.apmterminals.com.

Asher, C. C., Mahoney, J. M., & Mahoney, J. T. (2005). Towards a property rights foundation for a stakeholder theory of the firm. *Journal of Management & Governance*, *9*(1), 5ï 32. http:// doi:10.1007/s10997-005-1570-2

Banerjee, S., & Iglewicz, B. (2007). A simple univariate outlier identification procedure designed for large samples. *Communications in Statistics-Simulation and Computation*, *36*(2), 249ï 263.

Bang-Yen, C. (2011). On some geometric properties of h-homogeneous production functions in microeconomics. *Kragujevac Journal of Mathematics*, *35*(3), 343ï 357.

Banker, R., Emrouznejad, A., Bal, H., Alp, I., & Cengiz, M. A. (2013). Data envelopment analysis and performance measurement. In *proceedings of the 11th International Conference of DEA*. Turkey: DEA2013. Retrieved from http://www.academia.edu

Barnett, S. A. (2000). Evidence on the fiscal and macroeconomic impact of privatization. IMF Working Paper, Vol. , pp. 1-25, 2000. Available at SSRN: https://ssrn.com/abstract=879900Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=879900.

Barro, R. J. (1989). *Economic growth in a cross section of countries*. National Bureau of Economic Research. http://doi:10.3386/w3120. Retrieved from http://www.nber.org/papers/w3120.

Barro, R. J. (1991). Economic growth in a cross section of countries. *The Quarterly Journal of Economics*, *106*(2), 407ï 443.

Barro, R. J. (1996). *Determinants of economic growth: A cross-country empirical study*. National Bureau of Economic Research. http://doi:10.3386/w5698. Retrieved from http://www.nber.org/papers/w5698.

Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics, 20*(2), 325ï 332. https://doi.org/10.1007/BF01205442.

Baumol, W. J. (1986). Productivity growth, convergence, and welfare: What the long-run data show. *The American Economic Review*, 1072ï 1085.

Bennett, J., Estrin, S., & Urga, G. (2007). Methods of privatization and economic growth in transition economies. *Economics of Transition*, *15*(4), 661ï 683. https://doi.org/10.1111/j.1468-0351.2007.00300.x.

Bernerth, J. (2004). Expanding our understanding of the change message. *Human Resource Development Review, 3*(1), 36ï 52.

Birdsall, N., & Nellis, J. (2003). Winners and Losers: Assessing the distributional impact of privatization. *World Development, 31*(10), 1617ï 1633.

Boardman, A. E., & Vining, A. R. (1989). Ownership and performance in competitive environments: A comparison of the performance of private, mixed, and state-owned enterprises. *Journal of Law and Economics*, 1ï 33.

Boris, N., & Whited, T. (2009). *Agency conflicts and cash: Estimates from a structural model*. Working Paper.

Boubakri, N., Smaoui, H., & Zammiti, M. (2009). Privatization dynamics and economic growth. *Journal of Business & Policy Research*, *4*(2), 16ï 44.

Brodie, P. (1997). *Dictionary of Shipping Terms, Third Edition, 1997, and Sullivan, Eric, The Main Encyclopedic Dictionary, Fifth Edition, 1996.* (Third). Sullivan, Eric. Retrieved from http://www.seinemaritime.net/suports/uploads/files/Glossary%20of%20Port%20and%20Shipping%20Terms.pdf.

Brunetti, A., & Weder, B. (1994). Political credibility and economic growth in less developed countries. *Constitutional Political Economy*, *5*(1), 23ï 43.

Bua Ports & Terminal Limited (2016). Retrieved August 6, 2016, from https://www.buagroup.com/portservices.

Business, D. (2014). *Doing business 2015: Going beyond efficiency*. Technical report, the World Bank. Retrieved from http://elibrary.worldbank.org/action/showPublications?PubType=book&sortBy=TitleSort_desc&target=browse&pageSize=&startPage=342.

Button, K. (1998). Infrastructure investment, endogenous growth and economic convergence. *Annals of Regional Science*, *32*(1), 145

Caldeirinha, V. R., Felício, J. A., & Coelho, J. (2009). The influence of characterizing factors on port performance, measured by operational, financial and efficiency indicators. *Recent Advances in Environment, Energy Systems and Naval Science*. Retrieved from http://www.wseas.us/e-library/conferences/2011/Barcelona/MNICEG/MNICEG-09.pdf.

Calderón, C., & Servén, L. (2010). Infrastructure and economic development in Sub-Saharan Africa. *Journal of African Economies*, *19*(suppl 1), i13ï i87.

Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-expetrimental design for research*. Boston: Houghton Mifflin.

Carrodano, P. L. (2009). Effects of port congestion and strikes on Nigeriaôs economy. *Dredge. Drill and Haul and African Plants and Equipment Digest*, *2*(1). Retrieved from http://www.ddhmag.com/2ndqtr09portcongestcarrodano.htm.

Cavaliere, A., & Scabrosetti, S. (2008). Privatization and efficiency: from principals and agents to political economy. *Journal of Economic Surveys, 22*(4), 685ï 710.

Chang, H.-J. (2002). Breaking the mould: An institutionalist political economy alternative to the neo-liberal theory of the market and the state. *Cambridge Journal of Economics*, *26*(5), 539ï 559. https://doi.org/10.1093/cje/26.5.539.

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, *2*(6), 429ï 444. https://doi:10.1016/0377-2217(78)90138-8.

Cheon, S., Dowall, D. E., & Song, D.-W. (2010). Evaluating impacts of institutional reforms on port efficiency changes: Ownership, corporate structure, and total factor productivity changes of world container ports. *Transportation Research Part E: Logistics and Transportation Review*, *46*(4), 546ï 561. https://doi.org/10.1016/j.tre.2009.04.001.

Chigbue, I., & BPE. (2007). *The Bureau of Public Enterprises: 1999-2007*. Presented at the National Council on Privatization, Abuja, Nigeria.

Collier, P., & Gunning, J. W. (1999). Explaining African economic performance. *Journal of Economic Literature*, 64ï 111. Retrieved from http://www.jstor.org/stable/2564726.

Cook, P., & Uchida, Y. (2003). Privatisation and economic growth in developing countries. *Journal of Development Studies*, *39*(6), 121ï 154. http://dx.doi.org/10.1080/00220380312331293607.

Countouris, N., & Freedland, M. (2013). *Resocialising Europe in a time of crisis*. Cambridge University Press.

Cullinane, K., Ji, P., & Wang, T. (2005). The relationship between privatization and DEA estimates of efficiency in the container port industry. *Journal of Economics and Business*, *57*(5), 433ï 462. https://doi.org/10.1016/j.jeconbus.2005.02.007

Cullinane, K., & Song, D.W. (2002). Port privatization policy and practice. *Transport Reviews*, *22*(1), 55ï 75. https://doi.org/10.1080/01441640110042138.

Cullinane, K., & Song, D.W. (2006). Estimating the relative efficiency of European container ports: A stochastic frontier analysis. *Research in Transportation Economics*, *16*, 85ï 115. https://doi.org/10.1016/S0739-8859(06)16005-9.

Cullinane, K., Song, D.W., & Gray, R. (2002). A stochastic frontier model of the efficiency of major container terminals in Asia: Assessing the influence of administrative and ownership structures. *Transportation Research Part A: Policy and Practice*, *36*(8), 743ï 762. https://doi.org/10.1016/S0965-8564(01)00035-0.

Cullinane, K., & Tengfei Wang. (2010). The efficiency analysis of container port production using DEA panel data approaches. *OR Spectrum*, *32*(3), 717ï 738. https://doi.org/10.1007/s00291-010-0202-7.

Cullinane, K., & Wang, T. F. (2006). Data envelopment analysis (DEA) and improving container port rfficiency. *Research in Transportation Economics*, *17*, 517ï 566. https://doi.org/10.1016/S0739-8859(06)17023-7.

Cullinane, K., Wang, T. F., Song, D.-W., & Ji, P. (2006). The technical efficiency of container ports: Comparing data envelopment analysis and stochastic frontier analysis. *Transportation Research Part A: Policy and Practice*, *40*(4), 354ï 374. https://doi.org/10.1016/j.tra.2005.07.003.

Dangote Group. (2016). Retrieved August 6, 2016, from https://www.dangote.com/portservices.

Davis, C. (2007). The politics of ports: privatization and the worldôs ports. *International Labor and Working-Class History*, 71(1), 154ï 161. https://doi.org/10.1017/S0147547907000385.

De Borger, B., Kerstens, K., Moesen, W., & Vanneste, J. (1994). A non-parametric free disposal hull (FDH) approach to technical efficiency: An illustration of radial and graph efficiency measures and some sensitivity results. *Swiss Journal of Economics and Statistics*, *130*(4), 647ï 667. http://s3.amazonaws.com/academia.edu.documents

De Soto, H. (1993). The missing ingredient. *The Economist*, *328*(7828), 8ï 10.

Demsetz, H. (1967). Toward a theory of property rights. *The American Economic Review*, *57*(2), 347ï 359.

Dharwadkar, R., George, G., & Brandes, P. (2000). Privatization in emerging economies: An agency theory perspective. *The Academy of Management Review, 25*(3), 650ï 669. https://doi.org/10.2307/259316.

Díaz-Hernández, J., Martínez-Budría, E., & Jara-Díaz, S. (2008). Productivity in cargo handling in Spanish ports during a period of regulatory reforms. *Networks & Spatial Economics, 8*(2/3), 287ï 295. https://doi.org/10.1007/s11067-007-9056-1

Ducruet, C., & Merk, O. (2013). Examining container vessel turnaround times across the world. *Port Technology International*, *59*, 18ï 20.

Easterly, W., & Levine, R. (2003). Tropics, germs, and crops: How endowments influence economic development. *Journal of Monetary Economics, 50*(1), 3ï 39. Retrieved from http://www.sciencedirect.com/science/article/pii/S0304393202002003.

ECM Terminals Limited (2016). Retrieved August 6, 2016, from https://www.ecomarinegroup.com.

Eniola, O. J., Njoku, I., Oluwatosin, F. A., & Okoko, E. (2014). Performance evaluation of Nigerian ports: Pre and post concession eras. *Civil and Environmental Research*, *6*(2), 1ï 13. Retrieved from http://s3.amazonaws.com/academia.edu.documents/34229599/Performance_Evaluation_of_Nigerian_Ports.pdf?

ENL Consortium Limited. (2016). Retrieved August 6, 2016, from https://www.port.enlconsortium.com.

Enriquez, A. (1991). *Multi-purpose port terminals: Recommendations for planning and management*. Retrieved from http://trafficlight.bitdefender.com/info?url=http%3A//trid.trb.org/view.aspx%3Fid%3D339797&language=en_US.

Esmer, S. (2008). Performance measurements of container terminal operations. Retrieved from https://dspace.deu.edu.tr/xmlui/handle/12345/5405.

Estache, A., de la Fé, B. T., & Trujillo, L. (2004). Sources of efficiency gains in port reform: A DEA decomposition of a Malmquist TFP index for Mexico. *Utilities Policy*, *12*(4), 221ï 230. https://doi.org/10.1016/j.jup.2004.04.013.

Estache, A., González, M., & Trujillo, L. (2002). Efficiency gains from port reform and the potential for yardstick competition: Lessons from Mexico. *World Development*, *30*(4), 545ï 560. https://doi.org/10.1016/S0305-750X(01)00129-2.

Ezema, B. I., & Ogujiuba, K. (2011). The developmental state debate: Where is Nigeria? *Journal of Sustainable Development, 5*(1), 100 - 103. Retrieved from http://search.proquest.com/openview/ce894dbe27b81108796eb703e34b2f19/1?pq-origsite=gscholar.

Fairchild, J. A. (2002). *Instrument reliability and validity: Introductory concepts and measures*. Philadelphia: James Madison University.

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics* (4th Edition). SAGE Publication Inc.

Filipovic, A. (2005). Impact of privatization on economic growth. *Undergraduate Economic Review, 2*(1), 7. Retrieved from http://digitalcommons.iwu.edu/uer/vol2/iss1/7/.

Fischer, S. (1993). The role of macroeconomic factors in growth. *Journal of Monetary Economics*, *32*(3), 485ï 512.

Five Star Terminal Logistics Limited. (2016). Retrieved August 6, 2016, from https://www.fivestarlogisticsltd.com

Frankfort-Nachmias, C., & Nachmias, D. (2008). *Research Methods in Social Sciences* (7th ed.). London: Worth Publishers.

Frees, E. W. (2004). *Longitudinal and panel data: Analysis and applications in the social sciences*. Cambridge University Press. Retrieved from https://books.google.com.ng/books.

Gallup, J. L., Sachs, J. D., & Mellinger, A. D. (1999). Geography and economic development. *International Regional Science Review, 22*(2), 179ï 232.

Ghani, N., Ohta, K., & Yusoff, M. (2003). The impact of privatization policy on efficiency: Empirical evidence from a Malaysian port. *Journal of the Eastern Asia Society for Transportation Studies*, *5*. Retrieved from http://www.easts.info/2003journal/papers/2883.pdf.

Gidado, U. (2015). Consequences of port congestion on logistics and supply chain in african ports. *Developing Country Studies*, *5*(6), 160ï 167. Retrieved from https://www.researchgate.net/profile.

González, M. M., & Trujillo, L. (2008). Reforms and infrastructure efficiency in Spainôs container ports. *Transportation Research Part A: Policy and Practice*, *42*(1), 243ï 257. https://doi.org/10.1016/j.tra.2007.08.006.

Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. P. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods, 20*(1), 102ï 116. https://doi.org/10.1037/a0038889.

Harrison, J. (2010). Data envelopment analysis (DEA): A method for measuring efficiency, benchmarking and continuous improvement. *Presented at the 10th Annual effective management accountant conference.* Retrieved from http://www.conferenz.co.nz/whitepapers/data-envelopment-analysis-dea-method-measuring-efficiency-benchmarking-and-continuous-im.

Heitger, B. (2003). Property rights and the wealth of nations: A cross-country study. *Cato J.*, *23*, 381.

Henisz, W. J. (2000). The institutional environment for economic growth. *Economics and Politics*, *12*(1), 1ï 31.

Hockney, L. A., & Whiteneck, L. L. (1986). Port handbook for estimating marine terminal cargo handling capability: Executive summary. Retrieved from http://trid.trb.org/view.aspx?id=392985.

Huang, Y., & Peng, J. (2014). Efficiency evaluation between port logistics and economic growth by DEA: A Case Study of Zhejiang Province. *Journal of Applied Sciences, 14*(20), 2594ï 2600. https://doi.org/10.3923/jas.2014.2594.2600.

Hung, S.W., Lu, W.-M., & Wang, T.P. (2010). Benchmarking the operating efficiency of Asia container ports. *European Journal of Operational Research*, *203*(3), 706ï 713. https://doi.org/10.1016/j.ejor.2009.09.005.

Idornigie, P. O. (n.d.). Public-private partnerships: The issues, prospects and challenges. Retrieved from http: //www.paulidornigie.org/.

Ifionu, E. B., & Ogbuagu, A. R. (2013). Privatization and economic performance: Evidence from Nigeria (1990ï 2010). *African Research Review*, *7*(2), 16ï 43. http://dx.doi.org/10.4314/afrrev.v7i2.2.

Intels Nig. Limited. (2016). Retrieved August 6, 2016, from https://www.intelsservices.com.

Jaja, C. (2009). Port development in Nigeria: Trends and patterns. *Journal of Transportation Security*, *2*(4), 107ï 119. DOI: 10.1007/s12198-009-0028-1

Jaja, C. Y. (2011). Freight Traffic at Nigerian Seaports: Problems and prospects. *The Social Sciences*, *6*(4), 250ï 258. https://doi:10.3923/sscience.2011.250.258.

Jayasuriya, D. (2011). Improvements in the World Bankôs ease of doing business rankings: Do they translate into greater foreign direct investment inflows? *World Bank Policy Research Working Paper*, (5787). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1923545.

Julius Berger Plc. (2016). Retrieved August 6, 2016, from https://www.julius-berger.com/portservices.

Kenny, D. A. (1975). Cross-lagged panel correlation: A test for spuriousness. *Psychological Bulletin*, *82*(6), 887. http://dx.doi.org/10.1037/0033-2909.82.6.887.

Kessy, P. J. (2008). *Financial sector efficiency and economic growth: The case of East African Community (EAC) countries*. Retrieved from http://www.csae.ox.ac.uk/conferences/2008-edia/papers/019-kessy.pdf.

Kim, J., & Mahoney, J. T. (2005). Property rights theory, transaction costs theory, and agency theory: An organizational economics approach to strategic management. *Managerial and Decision Economics*, *26*(4), 223ï 242.

Kirikal, L. (2005). *Productivity, the Malmquist index and the empirical study of banks in Estonia*. Tallinn Technical University Press. Retrieved from http//digi.lib.ttu.ee/archives/2006/2006-07/1153225915.PDF&language=en_US.

Kirikal, L., & Tehnikaülikool, T. (2005). *Productivity, the Malmquist index and the empirical study of banks in Estonia*. Tallinn Technical University Press. Retrieved from http://digi.lib.ttu.ee/archives/2006/2006-07/1153225915.pdf.

Laerd Statistics. (2013). How to perform a multiple regression analysis in SPSS statistics | Laerd Statistics. Retrieved January 9, 2015, from https://statistics.laerd.com/spss-tutorials/multiple-regression-using-spss-statistics.php.

Lanza, V. (2012). The classical approach to capital accumulation: Classical theory of economic growth. Retrieved from http://www.diva-portal.org/smash/record.jsf?pid=diva2:562865.

Liker, J. K., Augustyniak, S., & Duncan, G. J. (1985). Panel data and models of change: A comparison of first difference and conventional two-wave models. *Social Science Research*, *14*(1), 80ï 101. https://doi:10.1016/0049-089X(85)90013-4

Liu, N., & Li, Y. (2007). Interaction between logistics development and economic growth in China. *Journal of Industrial Engineering Management*, *21*, 151ï 154.

Lord, H. G. (1973). *Ex post facto studies as a research method.* Special Report No. 7320. Retrieved from http://eric.ed.gov/%3Fid%3DED090962&language=en_US.

Lowe, A. (1954). The classical theory of economic growth. *Social Research, 21*(2), 127ï 158. Retrieved from Stable URL: http://www.jstor.org/stable/40982378.

Megginson, W. L., & Netter, J. M. (2001). From state to market: A survey of empirical studies on privatization. *Journal of Economic Literature*, *39*(2), 321ï 389. Retrieved from http://www.jstor.org/stable/2698243.

Megginson, W. L., & Sutter, N. L. (2006). Privatisation in developing countries. *Corporate Governance: An International Review*, *14*(4), 234ï 265. DOI: 10.1111/j.1467-8683.2006.00505.x.

Mencinger, J. (2003). Does foreign direct investment always enhance economic growth? *Kyklos, 56*(4), 491ï 508. https://doi:10.1046/j.0023-5962.2003.00235.x.

Mitra, Selowski, & Zalduendo. (2009). *Transition, the First 10 Years: Analysis and Lessons for Eastern Europe and the Former Soviet Union*. World Bank Publications. Retrieved from https://books.google.com/books .

Mohammed, A. S. (2008). Enhancing port efficiency through concession of operations. In *Being a paper presented by Abdul Salam Mohammed (Managing Director, NPA) at the African Ports and Harbour Congress, Johannesburg, South Africa*. Retrieved from http://www.nigerianports.org/.

Morgan, M., McFie, L., Fleetwood, L., & Robinson, J. (2002). Ecstasy (MDMA): Are the psychological problems associated with its use reversed by prolonged abstinence? *Psychopharmacology*, *159*(3), 294ï 303. DOI: 10.1007/s002130100907.

Ndikom, O. B. (2013). An appraisal of the operational limitations of the private terminal concessionaires in landlord port models. *Continental Journal of Social Sciences*, *6*(1), 9. https://doi:10.5707/cjsocsci.2013.6.1.9.16 .

Nellis, J. (2003). Privatization in Africa: What has happened? What is to be done? *FEEM Working Paper No. 127.05; Center for Global Development Working Paper No. 25.* Available at SSRN: https://ssrn.com/abstract=384421 or http://dx.doi.org/10.2139/ssrn.384421.

North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge [England]; New York: Cambridge University Press.

Nwanosike, F. (2014). *Evaluation of Nigerian ports post-concession performance* (Doctoral dissertation, University of Huddersfield). Retrieved from http://eprints.hud.ac.uk/24469/.

Obed, B. C., & Emeghara, G. C. (2012). A critical appraisal of port reform and development policy in Nigeria. *Research in Business and Management*, *1*(1), 13ï 22.

Odedokun, M. O. (1996). Alternative econometric approaches for analysing the role of the financial sector in economic growth: Time-series evidence from LDCs. *Journal of Development Economics*, *50*(1), 119ï 146. http://dx.doi.org/10.1016/0304-3878(96)00006-5.

Oghojafor, B. E., Kuye, O. L., & Alaneme, G. C. (2012). Concession as a strategic tool for ports efficiency: An assessment of the Nigerian ports. *American Journal of Business and Management*, *1*(4), 214ï 222.

Okeudo, G. N. (2013). Effect of port reform on cargo throughput level at Onne seaport Nigeria. A comparative study before and after reform policy implementation, *12*(1), 71ï 78. e-ISSN: 2278-487X, p-ISSN: 2319-7668.

Omoke, V., Diugwu, I. A., Nwaogbe, O. R., Ibe, C. C., & Ekpe, D. A. (2015). Infrastructure financing and management: The impact of concession on the operations and performance of Nigerian seaports. *Journal of Behavioural Economics, Finance, Entrepreneurship, Accounting and Transport*, *3*(2), 65ï 70. https://doi.org/doi:10.12691/jbe-3-2-1.

Önık, Z. (1991). The lLogic of the developmental state. *Comparative Politics*, *24*(1), 109ï 126. https://doi.org/10.2307/422204.

Parker, D., & Saal, D. S. (2003). *International handbook on privatization*. Massachusetts: Edward Elgar, Publishing.

Parrott, A. C., Heffernan, T., Buchanan, T., Scholey, A. B., Ling, J., & Rodgers, J. (2002). Ecstasy/MDMA attributed problems reported by novice, moderate and heavy recreational users. *Human Psychopharmacology: Clinical and Experimental*, *17*(6), 309ï 312. DOI: 10.1002/hup.415.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd Edition). California: Sage Thousand Oaks.

Plane, P. (1997). Privatization and economic growth: An empirical investigation from a sample of developing market economies. *Applied Economics, 29*(2), 161ï 178. http://dx.doi.org/10.1080/000368497327245.

Porcelli, F. (2009). Measurement of technical efficiency. A brief survey on parametric and non-parametric techniques. *University of Warwick, 11.* Retrieved 2 February 2014 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.232.4843&rep=rep1&type=pdf

Ports and Terminal Operators Limited (2016). Retrieved August 6, 2016, from https://www.ptolnigeria.com.

Quansah, N. E. (2014). Impact of privatization in ports: Measuring efficiency through data envelopment analysis and key performance indicators. Retrieved from http://dlib.wmu.se/jspui/handle/123456789/725.

Rodrik, D. (2006). Goodbye Washington consensus, hello Washington confusion? A review of the World Bankôs economic growth in the 1990s: Learning from a decade of reform. *Journal of Economic Literature, 44*(4), 973ï 987. https://doi.org/10.1257/002205106779436251.

Rudestam, K. E., & Newton, R. R. (2014). *Surviving your dissertation: A comprehensive guide to content and process*. CA: Sage Publications.

Rule of law. (n.d.) A Law Dictionary, Adapted to the constitution and laws of the United States. By John Bouvier. (1856). Retrieved July 10 2016 from http://legal-dictionary.thefreedictionary.com/Rule+of+law.

Sappington, D. E., & Stiglitz, J. E. (1987). Privatization, information and incentives. *Journal of Policy Analysis and Management, 6*(4), 567-582. https://doi: 10.3386/w2196.

Schwab, K., & WEF. (2014). *The Global Competitiveness Report 2014–2015* (Full Data Edition) (p. 565). World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf.

Seabrooke, W., Hui, E. C., Lam, W. H., & Wong, G. K. (2003). Forecasting cargo growth and regional role of the port of Hong Kong. *Cities, 20*(1), 51ï 64. http://dx.doi.org/10.1016/S0264-2751(02)00097-5.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). Quasi-experimental designs that either lack a control group or lack pretest observations on the outcome. *Experimental and Quasi-Experimental Designs for Generalized Causal Inference.* Boston: Houghton Mifflin Company, 103ï 134.

Sheshinski, E., & López-Calva, L. F. (2003). Privatization and its benefits: theory and evidence. *CESifo Economic Studies, 49*(3), 429ï 459. https://doi: 10.1093/cesifo/49.3.429.

Shoreline Logistics. Limited. (2016). Retrieved August 6, 2016, from https://www.shorelinelogistics.com.

Sifax Group. (2016). Retrieved August 6, 2016, from https://www.sifaxgroup.com/ports

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics, 70*(1), 65ï 94. https://doi.org/10.2307/1884513.

Standardized measurement and assessment. (n.d.). Retrieved September 30, 2014, from http://www.southalabama.edu/coe/bset/johnson/lectures/lec5.htm.

Starr, P. (1988). The meaning of privatization. *Yale Law & Policy Review, 6*(1), 6ï 41.

Stiglitz, J., & Godoy, S. (2006). Growth, initial conditions, law and speed of privatization in transition countries: 11 Years Later. Palgrave Macmillan UK. Retrieved from http://works.bepress.com/joseph_stiglitz/11.

Talley, W. K. (2006). Port performance: an economics perspective. *Research in Transportation Economics, 17*, 499ï 516. http://dx.doi.org/10.1016/S0739-8859(06)17022-5.

The Business Dictionary. (2013). Collaboration. *The Business Dictionary*. Retrieved from http://www.businessdictionary.com/definition/coordination.html#ixzz2mtPXG5U2.

Tian, X., Zhou, M., & others. (2008). Banking system efficiency and Chinese regional economic growth: An empirical analysis based on bankôs micro-efficiency. *The International Journal of business and finance research, 2*(1), 41ï 51.

Tongzon, J., & Heng, W. (2005). Port privatization, efficiency and competitiveness: Some empirical evidence from container ports (terminals). *Transportation Research Part A: Policy and Practice, 39*(5), 405ï 424. http://dx.doi.org/10.1016/j.tra.2005.02.001.

Tongzon, J. L. (1995). Determinants of port performance and efficiency. *Transportation Research Part A: Policy and Practice, 29*(3), 245ï 252. https://doi.org/10.1016/0965-8564(94)00032-6.

Tuckman, B. W., & Harper, B. E. (2012). *Conducting educational research*. Rowman & Littlefield Publishers. Retrieved from https//books.google.com/books

Turner, H., Windle, R., & Dresner, M. (2004). North American containerport productivity: 1984ï 1997. *Transportation Research Part E: Logistics and Transportation Review, 40*(4), 339ï 356. http://dx.doi.org/10.1016/j.tre.2003.06.001.

Udoka, C. O., & Anyingang, R. A. (2012). The effect of privatization on economic growth of Nigeria: 1979-2007 in Retrospect. *International Journal of Economic Development Research and Investment, 3*(2), 25ï 35.

United Nations Conference on Trade and Development (1971). *Port Performance Indicators*. Retrieved from http://unctad.org/en/PublicationsLibrary/tdbc4d131sup1rev1_en.pdf.

United States Institute for Peace. (n.d.). Rule of Law. Retrieved July 10, 2014, from http://www.usip.org/guiding-principles-stabilization-and-reconstruction-the-web-version/7-rule-law.

Valentine, V. F., & Gray, R. (2002). An organizational approach to port efficiency. In *Proceedings of the International Association of Maritime Economists Conference* (pp. 13ï 15).

Varmaghani, M., Meshkini, A. H., Farzadfar, F., Yousefi, M., Yaghoubifard, S., Varahrami, V., é Zekri, H.-S. (2014). Evaluation of productivity in Iranian pharmaceutical companies: A DEA-based Malmquist approach and panel data analysis. *Journal of Research in Pharmacy Practice*, *4*(2), 51ï 56.

Vickers, J., & Yarrow, G. (1991). Economic perspectives on privatization. *The Journal of Economic Perspectives*, 111ï 132.

Wacziarg, R. (2002). Review of easterlyôs the elusive quest for growth. *Journal of Economic Literature*, *40*(3), 907ï 918.

Williamson, J. (1990). What Washington means by policy reform. *Latin American Adjustment: How Much Has Happened*, *7*, 7ï 20.

Woo-Cumings, M. (1999). *The developmental state*. Cornell University Press. Retrieved from https://books.google.com/books.

World Bank. (2015, April 15). Release of World Development Indicators 2015 | Data. Retrieved December 25, 2015, from http://data.worldbank.org/news/release-of-world-development-indicators-2015.

Wright, M. D. (1993). Critique of the public choice theory case for privatization: Rhetoric and reality, A. *Ottawa L. Rev.*, *25*, 1.

Wu, Y.C. J., & Goh, M. (2010). Container port efficiency in emerging and more advanced markets. *Transportation Research Part E: Logistics and Transportation Review*, *46*(6), 1030ï 1042. https://doi.org/10.1016/j.tre.2010.01.002.

Yang, S., & Jianguo, Z. (2011). Research on the effects of logistics industry on economic growth in Jilin Province in China/R *Canadian Social Science*, *7*(6), 134.

Yoffee, N. (2001). [Review of *Review of privatization in the cncient near east and classical world*, by M. Hudson & B. A. Levine]. *Journal of the American Oriental Society*, *121*(2), 303ï 305. https://doi.org/10.2307/606587.

Appendix 1

List of Acronyms

2SLS	Two-stage least square regression analysis
AfDB	African Development Bank
BCC	Banker, Charnes, and Cooper (1984) variant of data envelopment analysis
BPE	Bureau of Public Enterprises
CAPITAL	Gross capital formation
CARGO	Total volume of inward- and outward-bound cargo processed or loaded and unloaded at a port location during a period under review
CBN	Central Bank of Nigeria
CCR	Charnes, Cooper, and Rhodes (1978) variant of data envelopment analysis
CEE	Central and Eastern Europe
CES	Normalized constant elasticity of substitution production function
CREDIT	Credit to the private sector as a percentage of GDP
DEA	Data envelopment analysis
DEAP	A data envelopment analysis (computer) program
DEBT	External debt as a percentage of the GDP
DMUs	Decision-making units
DTF	Distance to frontier
EFF	Total efficiency index
EFF	Proxy for deregulation

EFFCH	Efficiency change
FDI	Foreign direct investment
FGN	Federal Government of Nigeria
GDP	Gross domestic product
GDP_CAP	GDP per capita
GDP_CAP_G	GDP per capita growth
GDP_GRW	Annual GDP growth
GOV	Proxy for the index of corruption and the ratio of government consumption to GDP
HDI	Human Development Index
I_EFF	Inefficiency Index
IBM SPSS	International Business Machines-Statistical Package for the Social Sciences
ICRC	Infrastructure Concession Regulatory Commission
IMF	International Monetary Fund
IMO	International Maritime Organization
INF	Inflation rate
INT	Real interest rate
LABOR	Annual population growth
MBO	Management buyout
MEBO	Management-employee buyout
NBS	Nigerian Bureau of Statistics

NNPC	Nigerian National Petroleum Corporation
NPA	Nigerian Ports Authority
NSC	Nigerian Shippers Council
OECD	Organization for Economic Co-operation and Development
OPEN	Proxy for trade liberalization or trade openness is the ratio of exports and imports to GDP
PECH	Pure technical efficiency change
PPIAF	Public-Private Infrastructure Advisory Facility
PVA	Privatization variable
SAP	Structural Adjustment Program
SECH	Scale efficiency change
SFA	Stochastic frontier analysis
SOEs	State-owned enterprises
SSA	Subsaharan African countries
TECHCH	Technical efficiency change
TFP	Total factor productivity
TFPCH	Total factor productivity change
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
USD	U.S. Dollar
VIF	Variance inflation factor value
WB	World Bank

WEF	World Economic Forum
WTO	World Trade Organization