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ROLE OF CONSTRUCTION SECTOR IN ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM NIGERIA

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Abstract
The construction industry plays an important role in the economy, and the activities of the industry are also vital to the achievement of national socio-economic development goals of providing shelter, infrastructure and employment. It is clear that construction activities affect nearly every aspect of the economy and that the industry is vital to the continued growth of the economy. Surprisingly, the construction industry was left out from the list of major growth drivers of the economy. In order for construction to ably perform this role, there is a need to provide information on its economic value and its place in the overall economy of a country needs to be placed in perspective, if its function is to be fully understood. This study attempted to investigate the relationship between the construction sector and aggregate economy. Time series data from 1990 - 2009 on construction output and Gross Domestic Product (GDP) used for the study were extracted from the United Nation Statistic Division. This paper uses econometric techniques such as unit root test, cointegration test as well as Granger causality test to analyze the significance of construction linkage with the aggregate economy. The result indicates that construction output is Granger caused by GDP, while the construction output also granger causes the GDP. Both GDP and construction output lead each other by one year. The study concluded that the Nigerian construction sector is very important because of its capacity to lead the economy of Nigeria.
Keywords: *Construction output, Economy, Granger causality, GDP, Nigeria, Time series.*

Introduction

The construction industry plays an important role in the economy, and the activities of the industry are also vital to the achievement of national socio-economic development goals of providing shelter, infrastructure and employment (Anaman & Osei-Amponsah, 2007). The role of construction in the national economy has been addressed by a number of researchers. According to Khan (2008), the construction sector and construction activities are considered to be one of the major sources of economic growth, development and economic activities. Construction and engineering services industry play an important role in the economic uplift and development of the country. The construction industry is also a prime source of employment generation offering job opportunities to millions of unskilled, semi-skilled and skilled work force. Park (1989) asserted that the construction industry generates one of the highest multiplier effects through its extensive backward and forward linkages with other sectors of the economy. Ofori (1990) noted the importance of construction in the national economy and attributed it to the high linkages with the rest of the economy. The construction industry is regarded as an essential and highly visible contributor to the process of growth (Field & Ofori, 1988). World Bank, (1984) stated that the importance of the construction industry stems from its strong linkages with other sectors of the economy

The construction industry globally is widely criticized for its lackluster performance: a significant body of published and anecdotal evidence indicates that the construction industry has among the highest rates of corruption; construction projects invariably take longer than planned; overrun budgets; seldom adds value; subject workers to irresponsible and life-threatening risks; manifests variable quality; and generally underperforms as a production entity (Edwards 2002; ILO 2000; Wyk and Chege 2004; Woudhuysen and Abley 2004). Unfortunately, the construction sector is one of the most neglected sectors as policy makers have not promoted this industry as a driver of economic growth. This is reflected in the lack of attention given to the construction industry in government policies. Therefore, this paper aims at examining the relationship between construction output and economic growth in Nigeria in a view to determine the influence of the construction sector on the aggregate economy. This will propose the necessary action which must be taken in order for the country to derive the greatest benefit from the contribution which construction can make to national growth and development.

Literature review

The construction industry is often seen as a driver of economic growth especially in developing countries. The industry can mobilize and effectively utilize local, human and material resources in the development and maintenance of housing and infrastructure to promote local employment and improve economic efficiency (Anaman & Osei-Amponsah, 2007). The Nigerian Construction Sector (NCS) accounted for about 40% of the total capital formation in the pre-independence era, and in the post independent era, the proportion increased to more than 50% on the average (Aboyade, 1966).

From a percentage share of 3.8% in 1960, the sector contribution to GDP output rose to 4.22%, 4.38%, and 5.70% in 1965, 1970 and 1975 respectively. At the latter half of the 1970s, the percentage share of GDP rose massively to about 20% from 1979 through 1980. The contribution of the NCS to the GDP however significantly declined to an average of 4% in the late 1980s and 1990s. The decline in the 1980s is due to the slump in oil earning in the 1980s, forcing the suspension of many projects (Uwechue, 1991). The restructuring of the economy under the Structural Adjustment Programme (SAP) added to the woes of the sector (Faruqee, 1994).The declining fortunes of NCS resulted in massive dilapidation of public infrastructure.

However the advent of democracy in 1999 brought a new lease of life to the sector, with massive rehabilitation of infrastructure (Oghifo, 2000).

The NCS is faced with many challenges including the dominance of foreign contractors and inputs, dominance of government, instability, time and cost overruns etc (Baukley, Faulky & Olajide, 1994, Aniekwu, 1995, Ukwu, Obi, & Ukeje, 2003). However, The NCS is estimated to be about $3.15 billion in 2008. The annual growth rate is among the highest in Nigeria; with a remarkable 12.17% growth in 2005, this is more than double the growth of the GDP of 5.6%.

The NCS is projected to continue to grow very high in so far as the international price of oil remains high and the development of physical infrastructure remains high on the government's agenda (BMI, 2007, Dantata, 2008). Nigeria has the potential to become one of the largest construction markets in Africa. The NCS is forecasted to enjoy the fastest growth rate in the world even faster than India. From 2009 to 2020, only Nigeria and India would enjoy higher growth rates than China in their construction

output. This reflects increased wealth and urbanization resulting from the country's oil production. Road and rail projects are on the rise, contributing the major stimulus for growth and boosting industry value to US$7bn by 2014 (Business Monitor International, 2010).

Ameh and Odusami (2010) posited that construction industry in Nigeria comprises a group of heterogeneous and fragmented firms and, within firms, there is often a great diversity of activities. No other industry has similar characteristics. Typically, a large construction company may be engaged in activities ranging from general building and civil engineering to material manufacturing, property development, and trade specialization. Peripheral services such as material supply, plant hiring, and the newly emerging project management firms contribute to a complex industrial structure.

In Nigeria, government expenditure has continued to rise due to the huge receipts from production and sales of crude oil, and the increased demand for public (utilities) goods like roads, communication, power, education and health. Besides, there is increasing need to provide both internal and external security for the people and the nation. Available statistics show that total government expenditure (capital and recurrent) and its components have continued to rise in the last three decades. For instance, government total recurrent expenditure increased from N3, 819.20 million in 1977 to N4, 805.20 million in 1980 and further to N36, 219.60 million in 1990. Recurrent expenditure was N461, 600.00 million and N1, 589,270.00 million in 2000 and 2007, respectively (Central Intelligent Agency, 2010).

Nurudeen and Usman (2008) examined the composition of government recurrent expenditure which showed that expenditure on defense, internal security, education, health, agriculture, construction, and transport communication increased during the period of 1997 and 2007. Moreover, government capital expenditure rose from N5, 004.60 million in 1977 to N10, 163.40 million in 1980 and further to N24, 048.60 million in 1990. The value of capital expenditure stood at N239, 450.90 million and N759, 323.00 million in 2000 and 2007, respectively. Furthermore, the various components of capital expenditure also show a rising trend between 1977 and 2007.

Economic development in Nigeria

Nigeria's economic performance, since independence in 1960, has been decidedly unimpressive. It is estimated that Nigeria received over US$228 billion from oil exports between 1981 and 1999 (Udeh, 2000), and yet the number of Nigerians living in abject poverty – subsisting on less than $1 a day – more than doubled between 1970 and 2000, and the proportion of the population living in poverty rose from 36% to 70% over the same period. At official exchange rates, Nigeria's per capita income of US$260 in 2000 was precisely one-third of its level in 1980 according to Iyoha (2007). Meanwhile, during this period, Nigeria's external debt rose almost continuously, as did the share of its GDP owed annually in debt service.

Macroeconomic developments in recent years in Nigeria as noted by AfDB/OECD (2006) have been encouraging, with GDP growth averaging 6 per cent from 2000 through 2005. After reaching peak value of 10.2% in 2003, growth took downward trend to 6.1 per cent in 2004. Growth in 2005, estimated at 4.4 per cent, a much lower rate than the government's figure, was broadly based, with the oil, agriculture, construction and telecommunications sectors performing particularly well. High world oil prices have provided a big boost to the oil sector in recent years. In 2005, agricultural output increased by 7 per cent, up from 6.2 per cent in 2004, reflecting

both favourable weather conditions and government efforts to increase farmers' access to credit and fertilizers. Construction was estimated by the government to grow by 10 per cent in 2005 as a result of booming real estate development. Nigeria's telecommunications sector grew by 12 per cent following its accelerated liberalization and privatisation, which led to the introduction and rapid spread of the global system for mobile communications (GSM) services. Growth in the manufacturing sector, at 8 per cent in 2005, is lower than the 10 per cent recorded in 2004.

Construction linkages

The importance of the construction industry stems from its strong linkages with other sectors of the economy (Rameezdeen & Ramachandra, 2008). Bynoe (2009) affirmed that the construction sector is an important element of many countries' macroeconomic growth strategy. The industry is a major source of employment, and also lays the foundation for economic growth by providing the infrastructural and commercial framework needed for development. Furthermore, as has been shown by Lean (2001), there is evidence of a set of bi-directional causal relationships, which are considered to be important drivers of economic growth, between the construction sector and the other sectors of an economy. In addition the output of the industry is critical in supplying the infrastructure needed for the development of various sectors of a country's economy.

Given the recognized importance of the sector to economic development and growth, construction has been used extensively by policy makers as a tool, and changes to the portion of public spending going towards building activity has been a feature of various governments' fiscal policy measures. Indeed, the importance of the industry to economic growth, especially in the case of developing countries, where evidence suggests that the share of construction output to national output is highest and of greater importance (Ruddock and Lopes, 2006), continues to motivate research into the sector. Hosein and Lewis (2004) suggested that the importance of the industry in particular to a developing country, is due to its size, the fact that it provides investment goods, and the size of government involvement. Brathwaite (1982) as cited in Bynoe (2009) put forward that in Barbados, construction activity is important because of the role it plays in the investment process and because it can be used as an early indicator of economic trends.

The sectoral composition of output, the linkages between the different sectors and their combined impact on growth and development have been of interest to a variety of theoretical approaches to economic growth (Wild & Schwank, 2008). The concept of linkages in the economy is very important as there is unbalanced growth among supporting sectors of the economy. It is therefore important that an economic activity that has the ability to stimulate and drive others in the growth process should be given greater attention. The structure that can hold together those interrelated activities in the economy are hidden, scattered or badly utilized (Saka & Lowe, 2010).

Methodology

For the purpose of this paper, data were presented in tables and graphs. Data analysis is imperative and involved the use of multiple analytical techniques to facilitate the case of communicating the results which at the same time improving its validity. Since the data is a time series data, statistical tools employed for the analysis were Unit

root test, Cointegration test and Granger causality test. GRETL 2010 software made the analysis possible.

Unit root test

When time series data is used for analysis in econometrics, several statistical techniques and steps must be undertaken. In this paper, unit root test was applied to each series individually in order to provide information about the data being stationary as non-stationary data contains unit roots. The existences of unit roots make hypothesis test results unreliable. If the data are non-stationary, then frequently stationarity can be achieved by first differencing (Granger & Newbold, 1986).

The ADF test

The Augmented Dickey–Fuller (ADF) test is, as implemented in GRETL, the *t*-statistic on φ in the following regression:

$$y_t = \mu_t + \varphi y_{t-1} + \sum_{t-1}^{p} \gamma_t \Delta y_{t-1} + \epsilon_t \qquad (1)$$

This test statistic is probably the best-known and most widely used unit root test. It is a one-sided test whose null hypothesis is $\varphi = 0$ versus the alternative $\varphi < 0$. Under the null, y_t must be differenced at least once to achieve stationarity; under the alternative, y_t is already stationary and no differencing is required. Hence, large negative values of the test statistic led to the rejection of the null. One peculiar aspect of this test is that its limit distribution is non-standard under the null hypothesis: moreover, the shape of the distribution, and consequently the critical values for the test depends on the form of the μ_t term.

Cointegration test

To transform a co-integrated series to achieve stationarity, it must be differenced at least once. The number of times the data have to be differenced to become stationary is the order of integration. If a series is differenced *p* times to become stationary, it is said to be integrated of order *I*(*p*). Engel and Granger (1987) as cited in Khan (2008) pointed out that a linear combination of two or more non-stationary variables may be stationary. If such a stationary combination exists, then the non-stationary time series are said to be co-integrated.

There is evidence for a cointegrating relationship if:

(a) The unit-root hypothesis is not rejected for the individual variables.

(b) The unit-root hypothesis is rejected for the residuals (uhat) from the cointegrating regression.

Granger causality test

Granger causality tests nowadays are widely used to find the engine of an economic growth. To test whether construction flows stimulate aggregate economy or aggregate economy leads the construction activity, or if there are feedback effects between construction flows and the aggregate economy, the Granger causality test was used in the present study, fitted with yearly data from 1990 through 2009.

The model

The model estimated in this study involved two equations. These equations are specified as follows:

$$LNCNS_t = \alpha_0 + \alpha_1 LNGDP_t + u_t \quad (2)$$

$$LNGDP_t = \beta_0 + \beta_1 LNCNS_t + v_t \quad (3)$$

where $LNCNS_t$ is the real output of construction industry of Nigeria for year t, $LNGDP_t$ is the real gross domestic product of Nigeria for year t, u_t and v_t are the random error terms assumed to be uncorrelated.

Data presentation and analysis

In order to achieve the objectives of this study, the secondary data used for this research were sourced from United Nations Statistics Division (UNSD) http://unstats.un.org/unsd/economic, the CBN publications, Journals and reports for various years. The data spanning 1990-2009 and comprised the construction output and GDP were converted to their natural logarithm so as to remove exponential trends before testing for unit root, cointegration and Granger causality.

Results of the analysis

The causal relationship between construction sector and the aggregate economy was tested using Granger causality test. Firstly, the presence of unit root was determined using ADF test in order to establish the stationarity of the variables. Secondly, Johansen cointegration test was also applied to test for the existence of cointegration between variables.

Figure 1 shows the movement of LNCNS and LNGDP over the period of study from 1990 to 2009.

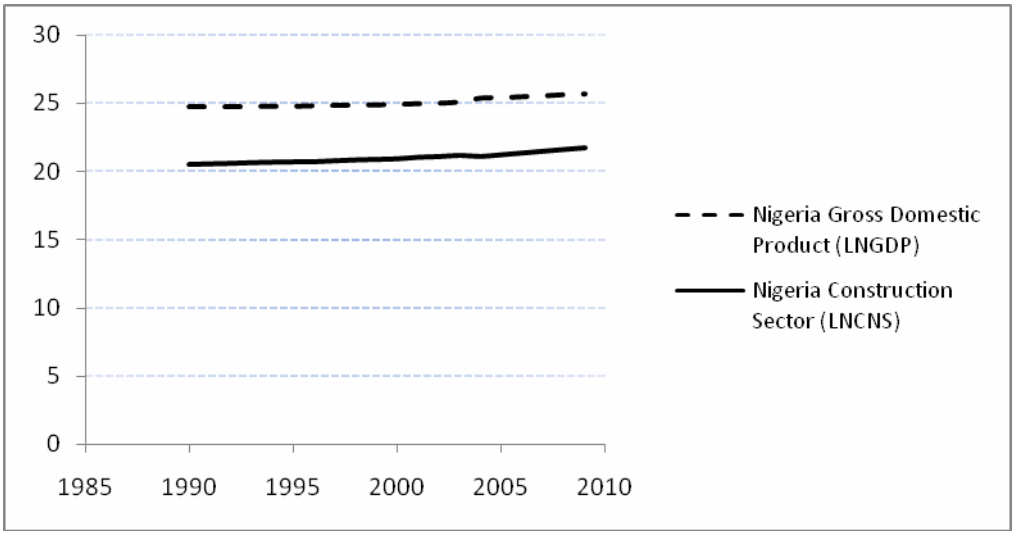

Figure 1: Movement of the series, LNCNS and LNGDP, for Nigeria from 1990 to 2009

Result of Unit Root tests

Table 1 shows ADF test for the variables. All the variables were not stationary at levels therefore the time series data were first differenced and the unit roots tests re-ran hence, LNGDP and LNCNS did not reject the null hypothesis of presence of unit root. However, the null hypothesis was rejected at second order integration, the series are therefore said to be I (2) series.

Unit root hypothesis:
H_0: A unit root does exist, i.e. variables are non-stationary
H_1: No unit roots, i.e. variables are stationary

Table 1 Unit root tests of variables at first and second differences

Variable	T- statistic	p-value	conclusion
DLNCNS	-0.8327	0.4181	
DLNGDP	0.2079	0.8381	
DDLNCNS	-3.736	0.0037 ***	I(2)
DDLNGDP	-4.397	0.0001 ***	I(2)

*** indicates highly significance at 0.01 level

Result for Cointegration Tests

Table 2 indicates that the Johansen cointegration test rejects the null hypotheses of no cointegration between LNCNS and LNGDP. Since cointegration exists, then it could be inferred that there is a long-term equilibrium contemporaneous relationship between the variables and they have a common trend. It can also be inferred that the null hypothesis which states that there is no significant causal relationship between GDP and construction output is rejected. With the establishment of cointegration, this also rules out the possibility of a spurious relationship between the variables, and also suggests that a causal relationship must exist in at least one direction (Chan, 2001). Since cointegration cannot indicate the direction of causality among economic sectors the Granger causality test is performed to determine the direction of causality.

Cointegration hypothesis:
H_0: there is no cointegration between the variables
H_1: there is cointegration between the variables

Table 2 Johansen cointegration tests

Series	Rank	Eigenvalue	Trace test	p-value
	0***	0.77605		33.95 [0.0000]
LNCNS & LNGDP	1**	0.25233		5.5252 [0.0187]

*** and ** denotes rejection of the hypothesis at the 1% and 5% level respectively

Result of Granger Causality tests

The result of the Granger causality test presented in Table 3 with the dependent variable specified as LGDP shows the relationship between the growth of GDP and the growth of construction sector (CNS) in Nigeria using natural logarithm of the variables. The table indicates that the null hypothesis of no significant relationship was rejected in both level form and first differences of the data. This means that LNCNS granger-caused LNGDP. Due to statistically significant parameter estimate for $LNCNS_{t-1,}$ it indicated that growth of construction sector preceded growth in the whole economy with a one-year lag in Nigeria.

Table 3 Results of granger causality test between CNS and GDP (Dependent variable is LNGDP)

Variables	Parameter estimate	T- statistic	p-value
$LNCNS_{t-1}$ *	0.563009	1.908	0.0771
$LNCNS_{t-2}$	-0.203581	-0.5993	0.5585
$LNGDP_{t-1}$ ***	1.04766	4.001	0.0013
$LNGDP_{t-2}$	-0.347597	-1.600	0.1319

*,*** indicates highly significant at 0.1 and 0.01 level respectively

In table 4, the dependent variable is specified as LCNS, which measures annual growth rate of construction industry. The table indicates that the null hypothesis of no significant relationship was rejected in both level form and first differences of the data. This rejection was due to statistically significant parameter estimate for $LNGDP_{t-1}$ which indicated that LNGDP granger-caused LNCNS. Thus the growth of the whole economy preceded growth in construction sector with a one-year lag in Nigeria.

Table 4 Results of granger causality test between LNCNS and LNGDP (Dependent variable is LNCNS)

Variables	Parameter estimate	T- statistic	p-value
$LNGDP_{t-1}$ *	0.482577	2.137	0.0507
$LNGDP_{t-2}$	-0.317626	-1.696	0.1121
$LNCNS_{t-1}$ ***	1.29041	5.071	0.0002
$LNCNS_{t-2}$	-0.486573	-1.661	0.1189

*** and * indicates highly significance at 0.01, 0.05 0.1 level respectively.

Discussion of results

This study shows that construction outputs can be classified as a major component of investment and part of fixed capital which are essential factors for a continuous economic growth. Products of construction require a long gestation period and are expected to supply services for a period of time. Investments in construction assume major importance since any expansion in the economy requires infrastructure investment as a precondition for potential economic growth (Ive and Gruneberg, 2000; Hillebrandt, 2000). Therefore, construction industry is frequently used as a tool by government to manage the local/national economy.

It is possible that expansion of construction activities is preceded by an increase in economic output, with the initial effect felt largely within the construction sector and only subsequently on the aggregate economy. Akintoye and Skitmore (1994) suggest that construction investment is a derived demand which is growth dependent. However, the results of the econometric models used by Akintoye and Skitmore (1994), who tested the relationship between national output and construction demand, are mixed.

The results of this study have revealed a strong relationship between construction and the aggregate economy of Nigeria. It is possible that expansion of construction activities is preceded by an increase in economic output, with the initial effect felt

largely within the construction sector and only subsequently on the aggregate economy. The cointegration result demonstrates the strong interrelationships between LNCNS and LNGDP. This means that the construction sector and GDP do not move independently of each other in the long run, instead they share a common trend which is in agreement with Saka and Lowe (2010). Table 3 and 4 present the results of the Granger causality tests for the natural logarithm of the variables. The data indicates that LNCNS is Granger caused by LNGDP, while the LNCNS also granger causes the LNGDP thus the relationship is bi-directional. Result implies that the Nigerian economy feed back into the construction sector after one year and vice versa. This agrees with finding of Saka (2010) in Nigerian economy and Anaman and Osei-Amponsah (2007) in Ghanian economy. This could be as a result of strong linkages between construction and other sectors of the economy.

Conclusion

With the use of econometric models the lead- lag relationship between gross domestic product and construction output have been tested and the following conclusion drawn. Boosting economic growth is one major reason for infrastructure development and the construction industry is regarded as an essential and highly visible contributor to the process of growth. Construction is a vital sector of any economy because of both its size and the potential role it can play in the development efforts of that economy. The construction industry has always been closely related to the national economy, it follows that more construction work will raise GDP through the multiplier, which in turn leads to a higher demand for construction orders. It should be noted that the demand for construction work is not autonomous. Rather it is determined by the level of GDP. Construction by itself is a large sector of the economy, responsible for millions of jobs and a significant proportion of GDP in most countries. When allied to other sectors and industries in material production and distribution, as well as service sectors such as transport, finance and the property market, its impact on society and the environment and its influence on the character of our world is tremendous.

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