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AN ANALYSIS OF PRODUCTION THEORY IN THE AGRICULTURAL AND SERVICE SECTORS OF NIGERIAN ECONOMY, 1981-2019

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Abstract

Production theory is a fundamental part of economic theory, and when applied to sectors of an economy, the theory can show how productive such sectors are. This study investigated the production theory in the agricultural and service sectors of Nigeria in order to ascertain how these sectors fit the theory. Autoregressive Distributed Lag Model (ARDL) and Bounds Test were used to analyze data collected for the study. The results showed that labour, capital, and electricity supply have a long run relationship with the agriculture and the service sectors output. In the long run, capital and electricity supply impacts positively on agriculture and service sectors output while labour impacts negatively on both sectors output. The impact of capital on both sectors is statistically significant. However, the short run results of the agricultural sector show that labour impacts positively but not significantly on the sector GDP. Capital impacts positively and significantly on the sector output, while electricity supply impacts negatively on the sector output. The short run result of the service sector indicates that capital impact positively and significantly on the sector output. Labour and electricity supply impact positively but not significantly on service sector output. A major recommendation, among others put forward, is the decentralization of power generation and distribution in Nigeria such that each state would be allowed to independently generate and distribute electricity as this would boost electricity supply which is a key factor in the production process.

Keywords: *Production, Agricultural Sector, Service Sector.*

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1. Introduction

Production theory explains the relationship between factors of production and output. It emphasizes that when factors of production are combined and put in some transformation process, the result will be output. The origin of the production theory can be traced back to the eighteenth century. Authors such as Adam Smith, David Ricardo and Thomas Malthus suggested the idea of production in their works but they did so without any logical or systematic treatment of the concept. Edwin (2015) points out that it was James Mill in his work entitled "*Elements of Political Economy"* who first attempted a logical and systematic treatment of production by devoting a complete chapter of his book to the concept of production. Although, the theory of production is in its first instance applicable to the firm, its application also extends to an economy as a whole or even specific sectors of an economy. In other words, production theory can be used to demonstrate how an economy or sectors of an economy can combine inputs or factors to produce outputs.

A country can hardly grow and sustain itself without production because it is only through the production process that output can grow or increase. In other words, countries without productive capacity usually depend excessively on the inflow from industrialized countries. If, for any reason, such inflow (technologies and skilled manpower) is truncated, the economy of such dependent countries becomes crippled. In fact, it is not uncommon for industrialized countries to sometimes deliberately truncate (in the form of sanctions) the inflow of vital technologies and manpower to developing countries as an economic or political weapon. This has a tremendous negative effect on the economy of developing countries. For instance, a country like Zimbabwe has suffered severely in this regard over the years, and the poor state of her economy clearly highlights how devastating the effect can be.

In recognition of the fact that a country can hardly grow and sustain itself without productive capacity, successive governments in Nigeria from independence have continuously endeavored to boost the country's productive capacity across the various sectors of the economy, and there is an urgent need to do more. Specifically, efforts have to be made to boost production in the agricultural and service sectors in order to diversify the country away from oil.

Shortly after independence, before the oil boom, which began in the early 1970s, much attention was given to boosting production in non-oil sectors such as the agricultural sector. In fact, agriculture was the leading sector of the Nigerian economy back then as the sector

contributed some 65 percent of Nigeria's GDP, 70 per cent of her aggregate exports and over 70 percent of employment for the population (Ogbalubi and Wokocha, 2013). Thus, there was not much difficulty in importing raw materials and capital goods as agriculture provided the needed foreign exchange. In addition, agricultural production from peasant farmers alone was enough to feed the entire population. The government then saw agriculture as the country's major revenue earner and focused on increasing the exportation of agricultural products to industrialized countries in order to raise the required fund for building infrastructure needed for long term development of the country.

However, the narrative changed as the oil boom period gradually crept in early in the 1970s. From an economy driven by the agricultural sector, the economy became driven by the oil sector and eventually became dependent on it. With very high current and expected revenue from the oil windfall, the government had the golden opportunity not only to build the needed infrastructure for development but also to invest massively in other sectors of the economy in order to diversify the economy. This was obviously not done in a practical sense as history is replete with either policy measures that were never implemented or programs that turned out to fail. Clearly therefore, the oil boom period was the genesis of Nigeria becoming a largely mono-cultural economy with the petroleum sector currently providing some 95 percent of her export earnings and some 70 percent of government revenue (Opue, Bassey and Bankong, 2018).

The danger of over reliance on oil production for the survival of the Nigerian economy has been highlighted over the years not only by those in the academia but also by those in government. This danger can be seen from two angles vis-à-vis the very potent possibility that oil as an exhaustible natural resource can dry up and the also very potent possibility that oil prices can crash tremendously as the world continues to search for alternative sources of energy. The recent crash in oil prices during the first tenure of the Buhari administration and its attendant consequences ranging from the inability of many states to pay salaries leading to the Federal Government handing out bailout funds to states is a clear reminder of the danger Nigeria faces from overly depending on the oil sector.

Poor management and over-reliance on the proceeds of crude oil production right from the oil boom era till date has created a very unstable macroeconomic environment for Nigeria. Besides, the effect of the recent fall in global oil prices that rocked the economy in 2016 was particularly evident in the low level of production in the various sectors of the economy since

revenue from the oil sector is the major means by which the government tries to stimulate production in other sectors. As a result, sectoral and aggregate GDP dropped drastically prompting the then Finance Minister, Kemi Adeosun, to stress that the economy was at "its worst possible time" (Premium Times, October 10, 2016). Statistical data obtained from the National Bureau of Statistics (NBS) actually confirmed her position. According to the NBS report of 2016, Nigeria's GDP declined by 2.0 percent, inflation rose by 17.1 percent and the economy contracted by 0.36 percent as at the first quarter of 2016.

In addition to the crash in oil price to less than $50 per barrel, oil production dropped by about 400,000 barrels due to the activities of Niger Delta militants. Thus while oil production stood at 2.11million barrels per day in the first quarter of 2016, it dropped to 1.69million barrels per day in the second quarter causing oil-based GDP to contract by 1.9 percent and 17.5 percent in the first and second quarters of 2016 respectively (NBS, 2016). It is evident therefore that even in the petroleum sector in which Nigeria hugely depends, production is not optimal and the revenues from oil production are not put to efficient use by those in government. This poses a grave economic danger as experts have continued to predict that oil will dry up in the nearest future as mentioned earlier. Even if oil does not dry up in the nearest future, it is very possible that it will become obsolete as a source of energy. After all, there was a time that coal was the major source of world energy but it eventually became obsolete. On the basis of the foregoing, it is clear that Nigeria need to boost production across board. There is need to focus attention on boosting production in other sectors such as the service and agricultural sectors.

Revamping the agriculture and the service sectors by taking practical steps to boost the sectors' production is a sure way of diversifying the economy away from oil. Boosting agricultural production in Nigeria must go beyond mere political rhetoric. The nagging issues that have crippled the sector's growth over the years despite much money allocated to the sector must be proactively tackled. Prominent among such issues are the difficulty experienced by peasant farmers in accessing modern farm inputs and credit facilities, loss of land and environmental degradation as a result of oil exploration and exploitation activities, the gap between agricultural research and implementation of findings, inadequate processing and storage facilities, lack of access to markets as a result of poor infrastructure such as roads and many other issues needing urgent proactive attention. Perhaps, a major problem that must be singled out is the deficit in practicality in the study of agricultural science in tertiary institutions across the country.

The service sector in Nigeria also has huge potentials. Oyejide and Bankole (2001) points out that the service sector has been a major contributor to Gross Domestic Product (GDP) in Nigeria with a peak contribution of 40 percent to GDP in 1993. However, when compared side by side with other sectors of the economy, it is evident that much still needs to be done to boost production in the service sector. The state of infrastructure in the service sector leaves much to be desired. Although the health and education sectors are not the primary focus of this work, it is necessary to point out the decay in these sectors as doing so brings to the fore the need to investigate productivity in the non-oil sectors of the Nigeria economy. Despite huge amount of money invested in the health sector annually to provide up to date health infrastructure and despite the rhetoric from government that the health sector is improving, there is clearly a crisis of confidence from even the government who argue that there is improvement in the sector because virtually all top government officials still continue to seek medical care abroad. The outcry by the wife of the president Aisha Buhari in 2017 when she pointed to the lack of facilities in the state house clinic and openly called for a probe into the health facility deficit is a sad summary of the poor state of health facilities in the country (Vanguard, October 9, 2017).

Our educational infrastructure remains unattractive both locally and globally. This is evident with the rate at which Nigerians seek education abroad especially in science related fields. The situation has become pathetic to the extent that young Nigerians now go to countries like South Africa, Ghana and Liberia for higher education. This also highlights the problem of the poor level of productivity in the Nigerian educational and other sectors hence, the high rate of poverty in the country.

Nigeria is ignominiously the poverty capital of the world (Sahara reporters, June 5, 2019). This embarrassing status was affirmed by the former British Prime Minister, Theresa May in June 2018. The World Poverty Clock (WPC) as at June 2019 shows that 91.8million Nigerians which is approximately 46.5 percent of the country's population of about 200million live in extreme poverty. Between June 2018 and June 2019, about 4million Nigerians fell into extreme poverty (Sahara reporters, June 5, 2019). The implication is that about half of Nigeria's population lives on less than a dollar (about N360) daily. Although these statistics have been rejected by the Buhari administration, the stack realities on ground suggest their authenticity. In neighborhoods across the country, it is not uncommon to see people begging for just a meal. This ugly situation becomes an irony when viewed side by side with the huge potential in the Nigerian agriculture and service sectors because, if these sectors are highly productive they can

feed the nation as well as provide employment for millions of Nigerians. Thus there is the need to analyze the level of productivity in the agriculture and service sectors of the Nigerian economy in order to chat a way forward to improve the sectors' performance. This paper determined the extent to which production theory applies in the Nigerian agricultural and service sectors.

2. Literature Review, Theoretical Framework, and Empirical Literature

2.1. Conceptual Clarifications

It is important at this juncture to highlight the meaning of the economic sectors under consideration for purpose of clarity. Hence, this literature review commences with very brief conceptual clarifications of the agricultural and service sectors.

The agricultural sector refers to all entities whether private or public that primarily engaged in the growing of crops, the rearing of animals and harvesting of fish. These activities may be in a farm, ranch or the natural habitat of the animals. These agricultural activities may be large scale and mechanized in nature for commercial purpose or small scale in nature for subsistence purpose. It should be noted that the agricultural sector is also known as the primary sector.

The service sector is also known as the tertiary sector. It is that branch of an economy that produces intangible goods or services such as information services, transportation services, warehousing services, legal services, banking or financial services, entertainment and tourism services, healthcare services, arts services, education and many more. The level of activities in the service sector of a country is often used to assess the level of advancement of the country such that the greater the level of service sector activities, compared to primary and secondary sector activities such as farming and manufacturing respectively, the greater the level of development or advancement.

2.2. Theoretical Framework

It is within the context of the Cobb-Douglas production function that this research work is laid. What is widely known today as the Cobb-Douglas production function was originally formulated and used by Knut Wicksell in 1900 (Velupillai 1973). The function became popularly associated with Charles Cobb and Paul Douglas because they were the first to test the function using empirical data. During the period of 1927 and 1947, they conducted

researches in the fields of economics and mathematics using data from developed countries around the world and came to the conclusion that there was a direct link between capital and labor on one hand and the real value of goods produced within a specific period of time on the other hand. They viewed capital as the real value of all machineries, buildings, equipment, parts, and facilities while they considered labour as the total number of hours put in by workers within a given period of time.

Conventionally, the Cobb-Douglas production function is written as:

$$Q = AL^{\alpha}K^{\beta}.$$

Where Q = Output, L = Labor, K = Capital. A, α and β are positive parameters where $\alpha > 0$, $\beta > 0$. L and K are the explanatory (independent) variables of the function while Q is the explained (dependent) variable. The portion of Q that is not explained by L and K is explained by the residual A which is referred to as technical change.

Marginal products (MPs) of labor and capital are expressed as functions of the parameters A, α and β and the ratios of the inputs as follow:

$$MPL = \partial Q/\partial L = AL^{\alpha-1}K^{\beta}$$

$$MPK = \partial Q/\partial K = \beta AL^{\alpha}K^{\beta-1}$$

The following should be noted about the Cobb-Douglas production function:

$\alpha+\beta > 1$: ***Increasing returns to scale***

$\alpha+\beta = 1$: ***Constant returns to scale***

$\alpha+\beta < 1$: ***Decreasing returns to scale***

The above non-linear form of the Cobb-Douglas production function can be transformed into a linear form by taking its logarithmic form as follows:

$$Log\ Q = log\ A + \alpha\ log\ L + \beta\ log\ K$$

The purpose of expressing the Cobb-Douglas production function in the linear logarithmic form is to make computation easier. When expressed in this form, it is referred to as the log linear production function. It should be noted that the Cobb-Douglas production function can be extended to include other factors. Thus, its expression above including only labor and capital serves as a theoretical guide in this work.

2.3. Empirical Literature

Abidemi (2010) investigated the productivity of the banking sector in Nigeria using data covering the period of 1960 to 2008 by estimating the Constant Elasticity of Substitution production function as well as the Cobb-Douglas production function. The Ordinary Least Squares (OLS) method was used to analyze data for the study. It was found that the Cobb-Douglas production function of the banking sector exhibits increasing returns to scale because the sum of the substitution parameters was greater than one. The same was found to be true for the substitution parameters of the Constant Elasticity of Substitution production function. Generally, the study showed that the Cobb-Douglas and Constant Elasticity of Substitution production functions of the banking sector in Nigeria are in line with the production function in economic theory.

Effiong and Umoh (2010) used the Cobb-Douglas production function to estimate the efficiency of profit and other important indices determining efficiency for the egg-laying industry in Akwa-Ibom State. They discovered that variable inputs such as feeds, price of drugs and general medication were statistically significant meaning that profit decreased when the prices of inputs increased while fixed factors such as capital inputs and the size of farm were statistically significant and had the appropriate theoretical sign, meaning that profit increased with an increase in the level of fixed factor utilization.

Baldwin, Brown and David (2010) investigated the impact of co-location on productivity of labor. In their work, they adopted Rosenthal and Strange's approach to measure the concentration of own industry impacts on productivity in Canada. They found that productivity increases as the number of plants in own industry and nearby distance increases. They also concluded that the impact on labor productivity of plants in farther distances was insignificant while plants within 5 kilometers have positive and significant effect on labor productivity.

Adetunji, Ibraheem and Ademuyiwa (2012) used the Restricted Least Squares (RLS) and F-test to examine the Nigerian economy between 1990 and 2009 in order to establish if the linear restriction of the Cobb-Douglas production function is applicable to Nigeria. It was established that the Nigeria economy during the period of study was characterized by constant returns to scale and that the restricted Cobb-Douglas production function fits the Nigerian economy.

Hassani (2012) sought out to investigate the application of the Cobb-Douglas production function in construction projects. The results indicated that for a better understanding of

construction crashing cost analysis, the use of the Cobb-Douglas production function is very important. Moreover, he found that labor and equipment efficiencies were very sensitive to the total cost of a project as their parameter estimates turned out highly significant. Mundlak (1996) adopted the use of a statistical model to estimate firm-level production function by applying the duality concept. He opined that this type of estimation will give consistent and more efficient estimates than using the direct production function of any form. This is because the input variables may be determined endogenously.

On their part Sagar, Eric, and Mikael (2013) used the Ordinary Least Squares (OLS) method in an attempt to analyze the statistical relationship between output and inputs of labor and capital in the Belgian labor market. Their estimated Cobb-Douglas production function indicates that there is a strong relationship between input goods, capital and labor and the output in the Belgian market

It is evident that quite a lot of studies have been carried out to test the production theory particularly the production function in different settings. However, there is obviously a lacuna in economic literature of studies analyzing how the production theory applies comparatively in the agricultural and service sectors of the Nigerian economy. This research work is therefore an attempt to fill this literature or research gap.

3. Methodology

The study employed secondary data specifically obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin of 2019. Data on Gross Domestic Product (GDP) for the agricultural and service sectors are used as proxies for output. Labor force employment rate, capital and electricity supply are used as proxies for inputs.

The Autoregressive Distributed Lag (ARDL) Model was instrumental in estimating the relationship between the variables in the models. The choice of the ARDL Model as estimation technique is not only because it is very good in establishing the long run relationship between variables but also because the Error Correction Model (ECM) is imbedded in it and as such it ensures that results obtained from it are reliable. To avoid obtaining spurious results and to be certain of the long-run behavior of variables used in this study, Unit Root Test on variables was conducted using the Augmented Dickey-Fuller Statistics to ensure stationarity of data. Also, Johansen Co-integration Test was applied to determine long-run relationship between the selected variables.

A. Model Specification

This work adopted two models. The first model represents the agricultural sector while the second represents the service sector.

Model 1

This model is for the agricultural sector and it is targeted at achieving the first objective of this work. It is specified as follows:

$GDP_A = f(L,K,E)$ ……..……..……(3.2a)

Note that GDP_A is annual Gross Domestic Product for the agricultural sector. L represents labor force employment rate, K represents capital while E represents electricity supply. When linearized, the agricultural sector model becomes:

$LogGDP_A = \beta o + \beta_1 LogL + \beta_2 LogK + \beta_3 LogE + U_1$……...……(3.2b)

It should be noted that the linearized form of the model is expressed in logarithmic form as it makes computation easier.βo, β_1, β_2 andβ_3 are all parameters to be estimated. The a priori expectation is that all the parameters will have positive signs. U_1, is the error or stochastic term in the model.

Assuming that the variables in the model are not well-behaved, the model is rewritten as:

$\Delta GDP_A = \beta o + \beta_1(\Delta L_{t-i}) + \beta_2(\Delta K_{t-i}) + \beta_3(\Delta E_{t-i}) + U_1$……...…(3.2c)

Where Δ is Difference Operator, β is Parameters to be estimated, t-I represent Unknown lags and

U_1 is Error Term

If cointegration is established, equation 3.2c above converges to the Error Correction Model (ECM) which is expressed as:

$\Delta GDP_A = \beta o + \beta_1(\Delta L_{t-i}) + \beta_2(\Delta K_{t-i}) + \beta_3(\Delta E_{t-i}) + \beta_4(ECM_{t-i}) + U_1$ ……(3.2d)

Where, B_4 is Speed of adjustment coefficient

Model 2

This is the service sector model designed to achieve objective two and specified as follows:

$GDP_S = f(L,K,E)$ …….. (3.2i)

GDP_S is annual Gross Domestic Product for the service sector. Just as it is with the previous models, L represents labor force employment rate, K represents capital while E represents electricity supply. The linearizedform of the service sector model is expressed as:

$LogGDP_S = \beta o + \beta_1 LogL + \beta_2 LogK + \beta_3 LogE + U_3$……... (3.2j)

The logarithmic form of the model above is to make computation easier. βo, β_1, β_2 andβ_3 are all parameters to be estimated. The a priori expectation is that all the parameters will have positive signs. U_3, is the error or stochastic term in the model.

Considering the possibility that the variables in the model are not well-behaved, the model is re-specified as:

$\Delta GDP_S = \beta o + \beta_1(\Delta L_{t-i}) + \beta_2(\Delta K_{t-i}) + \beta_3(\Delta E_{t-i}) + U_3$…… (3.2k)

Where, Δ is Difference Operator, β is Parameters to be estimated, t-I is Unknown lags and

U_3 represent Error Term.

If there is evidence of cointegration, equation 3.2k above converges to the Error Correction Model (ECM) which is expressed below:

$\Delta GDP_S = \beta o + \beta_1(\Delta L_{t-i}) + \beta_2(\Delta K_{t-i}) + \beta_3(\Delta E_{t-i}) + \beta_4(ECM_{t-i}) + U_3$……..……..… (3.2L)

Where B_4 represent Speed of adjustment coefficient

4. Data Analysis, Results, and Discussion

4.1. Unit Root Test

The Unit Root Test is designed to test for stationarity. The result is presented in Table 1 below.

Table 1: Unit Root Test (Augmented Dickey Fuller Statistics)

Variables	Levels	1st Difference	Order of Integration
GDP_A	-3.166671	-1.212449	1(0)
GDP_S	0.322856	-4.985309	1(1)
L	-1.602876	-2.545911	1(0)
K	0.688794	-4.757874	1(1)
E	0.229730	-6.696662	1(1)

Source: Authors' computation.

The Unit Root Test above clearly shows that the variables display a mixed order of integration. This therefore forms the basis for an Autoregressive Distributed Lag (ARDL) Model Bounds Test. Unlike the Unit Root Test which was done simultaneously for all the variables in the model irrespective of the sector they are being used for, the ARDL Bounds Test has to be done separately for each sector of the economy under consideration. The ARDL Bounds Test is designed to ascertain whether there is a long run relationship between the variables of each sector of the economy.

4.2. Agricultural Sector Results

Table 2: Bounds Test

ARDL Bounds Test
Sample: 2 38
Included observations: 37
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	13.74686	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: Authors' computation.

The Bounds Test above clearly shows that there is a long-run relationship between agricultural sector Gross Domestic Product (GDP_A) and the explanatory variables, namely: Labor, capital and electricity supply. This is because the F-statistic of 13.74686 is far greater than the upper bounds at all levels of significance.

Having established the existence of a long run relationship, the short run and long run estimates are presented in Table 3 below. The upper part of Table 3 (Cointegrating Form) shows the short run estimates while the lower part shows the long run estimates. Evidently, in the short run, labor (L), capital (K) and electricity supply (E) meet the a priori expectation of a positive relationship with agricultural sector GDP (GDP_A). However, only labor with a coefficient of 0.0000557 and a p-value of 0.0011 is statistically significant at the five percent level of significance. This is an indication that labor contributes enormously to agricultural sector GDP.

ARDL Cointegrating And Long Run Form
Dependent Variable: GDPA
Included observations: 37

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(K)	0.000171	0.000197	0.864185	0.3941
D(L)	0.000057	0.000016	3.610351	0.0011
D(E)	0.125345	0.266195	0.470877	0.6410
CointEq(-1)	-0.273298	0.054568	-5.008416	0.0000

Cointeq = GDPA - (0.0026*K + 0.0002*L + 0.4586*E -6115.0430)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
K	0.002594	0.000519	4.994072	0.0000
L	0.000209	0.000065	3.203780	0.0031
E	0.458638	0.943006	0.486357	0.6301
C	-6115.014	1640.147	-3.728313	0.0008

Source: Authors' computation.

All the long run coefficients meet the a priori expectation of a positive relationship with sectoral output. However, only capital (K, 0.002594) and labor (L, 0.000209) are statistically significant with p-values of 0.0000 and 0.0031 respectively. The fact that electricity supply (E) is not statistically significant may be a reflection of the poor state of electricity in the country. The

serial correlation test (shown in appendix) indicates a p-value of 0.2009 which is greater than 0.05 implying that there is no serial correlation among the variables. Likewise, the Ransey RESET test (also shown in appendix) has a p-value of 0.0900 which is greater than 0.05 indicating that the model for the agricultural sector is stable and good enough for the sector. Based on the fact that the agricultural sector coefficients meet the a priori expectation and tests for serial correlation and stability are favorable, we reject the null hypothesis in favor of the alternate. This implies that production theory is largely applicable in the agricultural sector. Thus the first specific objective of this work has been achieved and the answer to our first research question is affirmative.

4.3. Service Sector Results

Table 4: Bounds Test

ARDL Bounds Test
Included observations: 37
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	17.06204	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Source: Authors' computation.

At all levels of significance, the F-statistic of 17.06204 is greater than the upper bounds. This implied that there is a long run relationship between the variables in the service sector. In other words, the service sector inputs of labor, capital and electricity supply impact on service sector

GDP (GDP_S) in the long run. The precise nature of the long run relationship as well as the short run estimates are presented in Table 5 below.

The service sector estimates in table 5 provide strong evidence that production theory is largely applicable in the sector. This is because, in the short run all the coefficients meet the a priori expectation of being greater than zero even though only capital (K) is statistically significant. In the long run, all the coefficients are statistically significant at the five percent level of significance and, except labor (L), they all meet the a priori expectation of being greater than zero. This is certainly enough evidence to reject the second null hypothesis and accept the alternate.

Table 6: Service Sector Estimates

ARDL Cointegrating And Long Run Form
Dependent Variable: GDPS
Sample: 1 38
Included observations: 37

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(L)	0.000103	0.000055	1.870337	0.0723
D(K)	0.000249	0.000071	3.481204	0.0017
D(E)	0.090358	0.092283	0.979140	0.3362
CointEq(-1)	-0.296295	0.055826	-5.307490	0.0000

Cointeq = GDPS - (-0.0001*L + 0.0004*K + 0.1755*W + 1.1430*E + 296.0156)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L	-0.000052	0.000024	-2.181705	0.0380
K	0.000401	0.000175	2.297436	0.0296
E	1.142973	0.321418	3.556037	0.0014
C	296.0155	565.1414	0.523790	0.6047

Source: Authors' computation.

It is also an enough outcome to conclude that the answer to our second research question is affirmative and that the second specific objective of this work has been achieved. The production theory is very applicable in the service sector of Nigeria.

In addition, the serial correlation test (shown in appendix) has a p-value of 0.2044 which is greater than 0.05 which is an enough basis to conclude that the data for the service sector do not exhibit serial correlation. Similarly, the Ramsey RESET test (shown in appendix) has an F-statistic value of 0.0820 which is greater than 0.05 indicating that the service sector model is stable.

5. Conclusion and Recommendations

The broad objective of this work was to establish whether the production theory is applicable in the Nigeria agricultural and service sectors. In other words, this work has considered how well the agricultural and service sectors of Nigeria fit the production theory. The Autoregressive Distributed Lag Model (ARDL) was used as estimation technique and the Bounds Test was used to determine whether the variables have a long run relationship. Both sectors were found to be in alignment with the production theory. It should also be noted that in both sectors, there are few parameters that do not meet the a priori expectation but there is much more overwhelming evidence from the results to lend support to the production theory in both sectors. However, any discrepancies with a priori expectations give room for further studies.

The results obtained from the analysis reveal that both the agricultural sector and the service sector fit the production theory. This is because virtually all the parameters in the agricultural and service sectors meet the a priori expectation of having a positive relationship with sectoral GDP. Besides, some of the parameters in both sectors are statistically significant. It should be noted that the general results of a positive relationship between inputs and outputs (sectoral GDP) established both sectors align with the results of previous studies such as that of Sagar, Eric and Mikael (2013).

Recommendations

Based on the findings of this work, the following recommendations are put forward:

1. Because the contribution of electricity supply to sectoral GDP is virtually insignificant in both sectors, there is the need for government to improve power supply. This can be done by a total overhaul of the power generation and distribution structure in the country. This total overhaul should be geared towards decentralizing power generation and distribution. Thus, states should be allowed to independently generate and distribute power because it is common knowledge that there are serious problems associated with distribution of power solely from the national grid. States should wake up and legally challenge the Federal Government monopoly of power generation and distribution because power generation and distribution is in the concurrent list, not the exclusive list, in the 1999 constitution and as such the Federal Government cannot continue to ask states to pass through a rigorous process of getting licenses before they can generate and distribute power. By decentralizing power generation and distribution, businesses across all sectors will have greater access to power which is a key element in improving sectoral productivity.
2. Since labor is negatively related to sectoral output in the long run in the service sector, there is the need for government and even the private sector to adopt measures to boost the productivity of labor. In order to achieve this, the federal civil service commission as well as ministries, departments and agencies of government should base their employment strictly on specialization. It is an age long knowledge that specialization increases productivity.

Recommendation for Further Studies

In recent times, technology is considered a major factor of production. Technology is seen as the systematic application of the scientific, technical and managerial knowledge to the performance of productive activities and problem solving. The level of technology in the production process determines the rate of output. However, it is often very difficult to proxy technology. In studies in some countries, the total expenditure on research and development (R & D) is used to proxy technology. While the use of R & D expenditure even has its drawbacks, obtaining data for its use in Nigeria is very difficult. Hence, it is recommended that further studies should be carried out on the production theory in Nigeria with an appropriate proxy for technology.

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