

## INDIGENOUS TECHNOLOGY AS A PANACEA FOR NIGERIAN INDUSTRIALIZATION

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### **Abstract**

*This study centered on indigenous technology as the panacea for Nigerian industrialization. Time series data were sourced from Central Bank of Nigeria (CBN) Statistical Bulletin and World Bank Development Indicators. The period<sup>(2)</sup> of the study covered from 1981-2021. In this paper, Gross Domestic Product proxy for economic growth stands as the dependent variable while industrial output, population growth rate, oil export, technology and exchange rate are the independent variables. The Autoregressive Distributed Lag (ARDL) Bound Test was used for the estimation and E-view 10 econometric software was used for the analysis. Some of the major findings revealed that in the long-run, there existed positive significant relationship between economic growth and industrial output, population growth rate and exchange rate that oil export and technology as strategically as they are in the industrialization process are statistically insignificant. The paper recommended that in order to overcome the challenges arising from over dependence on the oil sector as the major sources of revenue that government should diversify in other sectors of the economy. Also, it is recommended in this paper that government should place greater emphasis on development of indigenous technologies by allocating more resources to research and development programmes and by promoting technical and technology education in our secondary and tertiary institution.*

**Keywords:** Technology, Oil export, Industrialization, Gross Domestic Product

### **Introduction**

The Sustainable Development Goals (SDGs) number 9 is directed towards building a resilient infrastructure, promoting inclusive sustainable industrialization and fostering innovation. The fact that industrialization has been specified as one of the global development agenda come 2030 is a strong indication of its importance towards achieving economic development. Industrialization can be defined as a process of transforming raw materials with the aid of human resources and capital goods into (a) consumer goods (b) new capital goods which allows for more consumer goods (including food) to be produced with the same human resources and (c) social overhead capital which together with human resources provide new services to both individual and business (Ekpo, 2005).

Being a process, the approach varies from country to country depending on individual countries endowments. It is not accidental or something that happens by chance, rather it is the transformation that

goes in stages as demonstrated by these theorists (Lewis (1954), Rostow (1960), Gerschenkron (1962), Chenery, Robinson and Syrquin (1986).

However, these models of growth that serve as launching pad for industrialization have heavily been criticized. Among the critics include Meier, Stiglitz, and Reynolds (Meier & Stiglitz (2001), Reynolds (1956)). Immediately after independence; Nigeria vigorously pursued various policies/schemes aimed at ensuring that the country becomes industrialization. A reflection of the country’s development process from the first development plan (1962-68) up to Nigeria vision 20-20 (NV20:20) reveals that the country has been making frantic efforts to become one of the industrialized nations yet there is no observable sustainable achievement with respect to industrialization (Maryam & Basse, 2018), (Kida and Angather 2020). Indeed, the quest by Nigeria to join the club of emerging and industrializing economies such as Brazil, Malaysia, Indonesia, India and China , and the expectation of the vision 2020 that the economy would be among the top 20 economies in the world by the year 2020 remains elusive (Iwayemi, 2019).

The quest for industrial development immediately after independence does not imply that nothing has taken place in this area before the independence. A reflection of the Pre-colonial era (pre 1900) will reveal that Nigerian citizens had enormous industrial potentials which were hindered by the actions of the colonial masters that focused only on the promotion of British industries. During that period, the Nigerian economy featured considerable crafts industries in various clans and kingdoms. Prominent among them were artifacts of wood, brass and bronze, leather, hand woven textiles and bags, iron workings and fire burnt pottery from local clay (Onyemelukwe 1983).

However, the Nigerian industrial narrative changed to the negative direction after the end of the Second World War in two respects. One was the increase in demand of industrial raw materials from Europe following the post war reconstruction needs and the other was the resumption of full-scale trade activities resulting in sharp rise in general purchasing power and investment potentials of indigenous businessmen (Adegbola 1983). Nations that strive to be industrialized in this present period are even faced with greater challenges due to globalization and internalization which are subtle ways by the developed countries of ensuring that the less developed countries remain permanently underdeveloped and marginalized. It is a well observed phenomenon that the LDCs which Nigeria is among act as if they have little or no choice but to import and adopt the foreign production techniques whose equipment they are unable to produce domestically.

According to Jhingan (2012), the Multinational Corporations (MNCs) of developed countries sell their capital intensive techniques which are inappropriate to the production and consumption needs of the LDCs and also worsen the unemployment situation in those countries.

Some of these MNC s for example (Shell, Nestle Foods, Paterson Zochonis (PZ) operated in Nigeria for over four decades, yet the technology is not transferred as most of the spare parts are skill imported.

Worse still, the maintenance of these foreign equipment in most cases requires the presence of the expatriates with huge financial costs and where they are not available, the machines become non-functional resulting in plant shut down as shown in the table below of some industries that closed in Nigeria due to plant break-down.

Industry	Location
Aluminum Smelter Co. of Nigeria Ltd	Ikot-Abasi
Nigerian Co. Plc	Nkalagu, Enugu State
Jos Stell Rolling Co. Ltd	Jos Plateau State
Katsina Stell Rolling Co. Ltd	Katsina, Katsina State
National Fertilizer Co. of Nig. Ltd	Onne, Rivers State

Source: U.S Geological Survey, Minerals Year Book 2004

For four decades, the country has pursued various schemes/policies to ensure that the nation becomes industrialized yet the economic indicators of growth in the level of industrialization are unimpressive. The industrial sector has been characterized by high import industrial inputs, dwindling capacity utilization, high cost of production, low value added, declining output growth, low employment generation and inadequate linkages with other sectors of the economy (Obioma & Ozughalu, (2005), Uzochukwu (2008).

An avalanche of researches has been carried out by scholars on industrialization and Nigerian economic growth. For instance, these scholars examined the impact of industrialization on economic growth by disintegrating the sectors (Nwogo & Orji, 2019, Kida & Angather, 2020, Aliyal & Odoh, 2016). On the role of energy on industrialization, scholarly contributions include (Osakwe 2017, Alley, Egbetunde, & Oligbi, 2016, Adedoyin, Bilal & Jelilov, 2019). This study differs from the previous studies in that its main focus is centered on indigenous technology as a panacea to Nigerian industrialization. Studies carried out by Effiong and Enang (2014), Onyemelukwe (1983) and Adegbola (1983) gave a good insight into the relevance of industrialization through indigenous technology. However this study differs from theirs both in methodology and the composition of the variables. This study paper is at variance with Gerschenkron's own view that the LDCs can only industrialize by adopting the most advanced capital intensive capital techniques of the DC.

The paper is organized as follows; section one is the introduction, section two is the review of the theoretical and empirical literature while section three dwells on the methodology. Section four presents and also analyses the results obtained while section five concludes and provides the recommendations.

## **Theoretical and Empirical Literature Review**

### **Theoretical Review:**

Some of the relevant theories to industrialization include the structural change theory of Arthur Lewis, the Rostowian stages of growth, the Gerschenkron's Great Spirit theory and the Dependency theory. In this paper, the dependence theory is reviewed. This is because the theory is very apt and suitable in describing the rationale for LDCs to chart their own course if they are to be industrialized instead of perpetually depending on developed countries. There are dependency economists with varying definitions (Sunkel (1969), Santos (1970), & Amin (1972)). However, the most comprehensive definition of dependency which is adopted in this study is one given by Santos Dos Theotonio (Santos (1970)). He defined dependency as a situation in which the economy of certain countries the LDCs called the periphery contributed by the development and expansion of another economy the developed countries (DC) called the centre'. The relationship has resulted in global historical phenomenon in which the rich nations (DC) are either intentionally exploitative or unintentionally neglectful to the extent that it renders attempts by the LDCs to be self-reliant and independent difficult and sometimes impossible (Todaro & Smith 2006). One of such attempts by the LDCs is to be industrialized. Santos in support of this statement categorically stated that the dependency is based upon an intentional division of labour which allows industrial development to take place in some countries while restricting it in others and its growth is conditioned by and subjected to the power centers of the world (Santos, 1970).

The views posed by the dependence economists have heavily been criticized that for LDCs to be industrialized they require local capabilities and technical skills. That any economic growth which rely heavily on imported capital goods, cannot be considered genuine development as there is nothing in such growth which deals with the problem of low social capacity for technological problem solving. Sanjaya (1975), Griffin & Gurley (1985)). However, in spite of the criticisms, the views expressed by Santos and other dependence theorists of deliberate design by the DC to keep LDCs in perpetual dependence have some element of validity.

### **Empirical Review**

Dozens of scholars have carried out studies on industrialization and economic growth for different countries and over different periods using different methodologies and a broad spectrum of these researches have been consulted in this study. Kida and Angather (2020) empirically evaluated the impact of industrialization on economic growth in Nigeria. Due to the link between industrialization and economic growth, both theoretical and econometric analysis were used in the evaluation using GDP as the dependent variable and crude petroleum and natural gas, manufacturing and solid minerals as the independent variables from 1981 – 2013. The study adopted OLS in formulating the model and found that crude petroleum and natural gas, manufacturing and solid minerals significantly contribute to economic growth in Nigeria.

Nwogo and Orji (2019) examined the impact of industrialization on economic growth in Nigeria. The study adopted the ex-post facto research design based on the efficacy in facilitating the projection of future outcomes with the past occurrences. The study found a positive and significant relationship between industrialization and economic growth. The study recommended that there is need for the government as a matter of urgency to develop stimulants for the manufacturing sector in form of tax incentives and credit facilities to enable the sector serve as a driving force to economic growth.

Maryam and Basse (2018) examined Nigeria industrial sector and economic growth in the face of sustainable Development Goals from 1981 to 2016 using data obtained from the World Bank Indicators. STATA was used to analyze the results which revealed that industrial output has a significant positive effect on economic growth in Nigeria.

Effiong and Enang (2014) researched on industrialization and economic development in a multicultural Milieu: Lessons for Nigeria. The study revealed that there exist a significant positive relationship between industrialization and economic growth and recommended that for Nigeria to develop industrially, it must indigenize technology contemporaneously. That the government must relearn the lost industrial lessons of the Nigerian civil war (1967-1970) and also pursue the path of fiscal federalism moderated by a fair design of central redistribution mechanism of the oil revenue in order to avoid “immiserating growth”.

Enwerem, Jelilov and Isik (2016) researched on the impact of industrialization on economic growth in Nigeria from 2000-2013 using GDP as the dependent variable in which industrial output, foreign direct investment, interest rate, and exchange rate were the independent variables. It was found that industrialization has a negative significant impact on economic growth in Nigeria in the long-run.

Aliyal and Odo (2016) studied the impact of industrialization on economic growth in Nigeria in which the sectors were disaggregated with Agriculture, industry and services to form the explanatory variables while GDP was the dependent variable. The study reveals that all the above mentioned sectors have significant positive effect on economic growth in Nigeria.

Ubi, Lionel and Eyo (2012) researched on monetary policy and industrialization in an emerging open economy. Lessons from Nigeria using industrial output as the dependent variable and exchange rate, trade openness, interest rate, balance of payment and money supply as the explanatory variables. The finding from the study revealed that all the variables have significant positive impact on industrialization.

Gylych and Enwerem (2016) in their study of the impact of industrialization on economic growth experience of ten countries in ECOWAS between (2000-2013), revealed that industrialization has a negative impact on economic growth in Nigeria in the long-run. The study recommended that government should redirect its industrial and investment policy in order to increase output of domestic production.

Isikal and Chimezie (2016) evaluated the impact of industrialization on Nigerian economic growth from 1999-2012 using Johansen co-integration testing approach. The result revealed that agriculture, industry and services have a significant positive relationship with GDP.

Ayorinde and Abdulwahab (2013) carried out a study on the modeling and forecasting of Nigerian crude oil exports using monthly data from January 2002 to December 2011 in which multiplicative Seasonal ARIMA (SARIMA) model was applied. The result indicates that the crude oil export was unstable and would remain so throughout the forecasted period.

Ndiebbio and Essia (1996) in their study of the after effect of Structural Adjustment Programme (SAP) observed that macroeconomic measures alone are not adequate for promotion of technological progress in Nigeria. That rather than promote technological capabilities, they tend to precipitate underutilization of production capacities, high inflation and unemployment rate.

## **Methodology**

### **Model Specification:**

The multiple regression model is adopted in this study to check the relationship between the gross domestic product proxy for economic growth which stands as the Dependant Variable and Industrial Output (INDO), Population Growth Rate (PGR), Oil export (OEXP), Technology Tech) and Exchange Rate (EXR)

the explanatory variables. Apart from PGR, Tech and EXR, all other Variables are presented in their logarithm forms.

The functional form of the model is stated as:

$$\text{Log GDP} = f(\text{Log INDO, PAR, Log OEXP, TECH, EXR}) \dots \dots \dots (1)$$

In order to estimate the above, equation (1) is put in econometric form as:

$$\text{Log GDP} = \beta_0 + \beta_1 \text{Log INDO} + \beta_2 \text{PGR} + \beta_3 \text{OEXP} + \beta_4 \text{TECH} + \beta_5 \text{EXR} + \mu \dots \dots (2)$$

Where:

- Log GDP =                      Logarithm of Gross Domestic Product
- Log INDO =                    Logarithm of Industrial Output
- PGR =                         Population Growth Rate
- Log OEXP =                  Logarithm of Oil Export
- TECH =                        Technology
- EXR =                         Exchange Rate
- $\mu$  =                            Error Term
- $\beta_0$  =                          Constant
- $\beta_1, \beta_2, \beta_3, \beta_4$  and  $\beta_5$  = coefficients of the independent variables.

**Econometric Procedure**

To empirically analyze the long-run relationships and the dynamic interactions between economic growth and the explanatory variables chosen in the study, the following procedures were adopted. Firstly, the time series properties of the variables were investigated in order to determine their order of integration and to avoid the problem of spurious regression results. Secondly, the existence of co-integration relationship was investigated following the approach developed by Pesaran, Shin and Smith (2001), using the Autoregressive Distribution Lag (ARDL) Co-integration test popularly known as the bound test. The ARDL bound test possesses several econometric advantages over other traditional approaches such as those of Engle and Granger (1987), Johansen (1988), Johansen and Juselius (1990). First, it is flexible and can be applied irrespective of whether the underlying regressors are purely 1(0), 1(1) or mutually co-integrated (Akpan & Atan 2012). The ADRL approach does not require pre-testing the order of integration and therefore it eliminates the uncertainty associated with pre-testing the variables. Also, the ARDL approach can be applied in studies that employ relatively small sample size such as this study. Lastly, the use of ARDL procedures ensures the estimation of the long and short-run parameters of a model.

**Sources of Data**

Time series data from 1981-2020, a period of 40 years was used in the study. The choice of this period relies on the fact that it covered the period of some remarkable efforts by the government of the country towards industrialization for example the structural adjustment programme (SAP). The data used in this study were obtained from Central Bank of Nigeria (CBN), Statistical Bulletin and World Bank Development Indicators 2020.

**Results and Discussions**

Having confirmed that all the variables were integrated of either order 1(0) or 1(1) and that none was integrated of order two, therefore the Autoregressive Distributed Lag (ARDL) Bound Test was applied (Pesaran, Shin & Smith 2001). The null hypothesis of ARDL bound co-integration is that the variables are not co-integrated as against that they are co-integrated.

**Decision Rule:** Reject the null hypothesis if the F-statistics is greater than the upper bound critical values at a chosen level of significance and in the case of this study, 5% is chosen. However, if the computed F-statistics falls between the lower and upper bound values, the result is inconclusive.

**Table 1:** ARDL Bound Co-Integration Test Result

F-Bounds Test		Null Hypothesis: No Levels relationship	
Test- static	Value	Significance Level	Critical Bond

			1(0) Lower Bound	1(1) Upper Bound
f-statistic	8.6608	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Source: Author’s Computation with E-Views 10, 2021.

Table 1 above shows that the F-statistics is 8.6608 and is greater than the upper critical bound value of 3.38 at 5% level of significance and therefore the null hypothesis of the long-run relationship is rejected. Therefore, there is a co-integration relationship between GDP, INDO, PGR, OEXP, TECH and EXR and presence of a long run relationship. Having confirmed the existence of a long-run relationship between economic growth and the explanatory variables in the model, an estimation of the long-run and short-run parameters were carried out.

Table 2: Summary of Parsimonious Short-Run Relationship between Industrialization and the Nigerian Economic Growth

ARDL Model (4, 4, 4, 4, 4, 4)

Dependent Variable: Log GDP

Method: Least Squares.

Variables	Coefficient	Std.Error	t-Statistics	Prob.
C	0.033950	0.137043	-3.140900	0.0034
D(Log GDP (-1))	1.128328	0.125903	8.961876	0.0001
D(Log INDO)	0.738444	0.056190	13.14186	0.0000
D(Log INDO (-1))	-0.995627	0.114923	-8.663427	0.0001
D(POGR)	1.124177	0.759697	1.479770	0.1894
D(POGR(-1))	3.593000	1.589368	2.260647	0.0645
D(Log OEXP)	-0.035406	0.021707	-1.631063	0.1540
D(Log OEXP(-1))	-0.064629	0.022026	-2.934286	0.0261
D(Tech)	0.030366	0.241848	0.125560	0.9042
D(Tech(-1))	0.186954	0.207517	0.900905	0.4024
D(EXTR)	0.001016	0.000145	7.011904	0.0004
D(EXTR(-1))	0.000639	0.000123	5.181498	0.0021
EMC(-1)	-1.789351	0.162499	-11.01145	0.0000

Source: Author’s Computation using E-view 10, 2021

The Coefficient of the error correction mechanism (ECM) is statistically significant and appropriately signed at 5% level of significance. The speed of adjustment is 1.789351 that is about 179% of last year’s disequilibrium is corrected in the current year and it indicates that the speed of adjustment is very high. The Coefficients of industrial output, population growth, technology and exchange rate are positive but only the industrial output, exchange rate and the lagged values of oil export and technology are statistically significant at 5% level of significance. This implies that improvement in industrial output, population growth, technology and exchange rate will bring about improvement in industrialization and economic growth in Nigeria.

Table 3: ARDL Long-run Bound test

ARDL Model (4,4,44,4,4)

Dependent variable Log GDP

Method: Least Square

Variable	Coefficient	Std Error	t-statistic	Prob
C	0.507808	0.319003	-1.591862	0.1625

Log/NDO	0.912057	0.068199	13.37338	0.0000
POGR	0.415095	0.115430	3.596079	0.0114
LOG OEXP	0.061703	0.052533	1.174555	0.2847
TECH	0.062282	0.876606	0.071049	0.9457
EXR	0.000526	0.000182	2.896871	0.0274

Source: Author's Computation using E-view 10, 2021.

The equation of the long-run ARDL result as deduced from table 3 is written as:

$$GDP = 0.5078 + 0.9121INDO + 0.4151PDGR + 0.0617OEXP + 0.0623TECH + 0.0005EXR.$$

The result shows that there exists a positive relationship between economic growth and all the explanatory variables in the long-run viz: Industrial Output (INDO), Population growth rate (PGR) Oil Export (OEXP) Technology (TECH) and Exchange Tare (EXR). That a unit increases in INDO, PDGR, OEXP, TECH and EXR will bring about 0.9121, 0.4151, 0.0617, 0.0623 and 0.0005 units change in economic growth respectively.

The result further revealed that apart from industrial output, population growth rate and exchange rate with probability values of 0.0000, 0.0114 and 0.0274 respectively that impact significantly on economic growth that oil export and technology with probability values of 0.2847 and 0.9457 have insignificant impact on economic growth in Nigeria. The significant impact of INDO, PGR, and EXR are in agreement with general economic principle. However, both oil export and technology possess insignificant impact to Nigerian industrialization.

It is interesting to note that the insignificant impact of oil export on Nigerian industrialization as deduced from the study is in consonance with the outcome of similar studies carried out by Bawa and Mohammed (2007), Ariwodola (2005), Appah and Ebiringa (2012, Sachs and Warner (2001), Deacon et al (2005), and Sala-I-Martin and Subramarian (2003). These scholars argue that natural resources abundant countries are faced with the Dutch disease syndrome, rent seeking and weak institutions and policies which hinder economic growth. The insignificant impact of technology to Nigerian Industrialization is a pointer to the fact that we are not getting it right and we should focus more on our indigenous technologies. As succinctly argued by Sanjaya (2004), condition for industrialization strategy which promotes efficient production require local capabilities and indigenous technologies. Development of indigenous technologies is achievable in a stable and functional educational system that encourages research and development.

### Conclusion and Policy Recommendations

This paper dwelt on the indigenous technology as the panacea for Nigerian industrialization. The aim was to investigate the rate of technology in the Nigerian industrialization. The study revealed that industrial output, population growth rate and exchange rate impact significantly to economic growth in Nigeria while oil export and technology play an insignificant role to Nigerian industrialization. It is not surprising that the result revealed an insignificant impact of oil export following a myriad of problems surrounding oil industry and the heavy dependence on the imported technology that undermine the nation's industrialization process.

Japan one of the industrialized nations of the world recognized the importance of indigenous technology and placed high premium on vocational education which gave sway to development of local skills and individual capabilities. Nigeria cannot wish away the vital importance of development of indigenous technologies and still expect to develop industrially. There should be a synergy between the research institutes and the industrial enterprises such that research programmes are harmonized and the results are geared towards commercialization.

Government should place greater emphasis on development of indigenous technologies by allocating more resources to research and development programmes and promoting technical and technology education in our secondary and tertiary institutions. Also, due to the fluctuation in the oil prices and myriad of problems facing the oil industry the paper recommends the government should adopt a paradigm shift from the heavy dependence on the oil sector and diversify to other sectors of the economy.

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