International Journal of Economics, Commerce and Management
United Kingdom ISSN 2348 0386 Vol. VIII, Issue 10, Oct 2020
http://ijecm.co.uk/

THE IMPACT OF PRODUCTIVITY AND EMPLOYMENT CREATION IN AUTOMOTIVE INDUSTRY ON ECONOMIC GROWTH IN NIGERIA: 1987-2019

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Abstract

This study examined the impact of productivity and employment in Automotive Industry in Nigeria for 1987 -2019 using time series data. We employed Autoregressive Distributed Lag Model (ARDL) estimation technique which was favoured by the result of the unit root test method. The findings from the result revealed that in the long run, the current values of Productivity (PDT) and Employment generation (EMP) in Automobile industry, Exchange Rate (EXR), Interest rate (INTR) and Inflation rate (INFR) show a statistically significant impact on economic growth, while the short run results show that only productivity and exchange rate significantly impacted on economic growth in Nigeria for the period under study. Hence, even though the industry has not lived up to its expectation, there is hope that, if the industry is supported by the government through finance and patronage by all and sundry backed up with the right policy and Act, the level of production will increase leading to increase in employment generation and eventually contribute to economic growth of Nigeria. It is therefore recommended that government should encourage importation of Completely Knocked Down (CKD) rather than Semi Knocked Down (SKD), support the industry by funding Auto Finance

Scheme to enable financial institutions give credit facilities to potential vehicle buyers at a single digit rate, discourage importation of used vehicles (called Tokunbo), ensure higher level of local content. All these will boost productivity and employment rate in the Automotive Industry as productivity in this sector is positively related to the growth of the economy.

Keywords: Productivity; Employment Creation; Automotive Industry; Economic Growth; Autoregressive Distributed Lag Model

INTRODUCTION

The automobile industry is one of the biggest industrial sectors in the world. Looking at the economic activities upstream and downstream of actual manufacturing, the sector's global value added stands at around 5–10 per cent. Worldwide there are around 500 million registered passenger cars. Their number continues to grow and by 2030 this will triple (Bartel et. al. 2015). Automobile manufacturing has undergone numerous rapid upheavals during the over 100 years of its existence. The major ruptures have been marked by shifts in production, demand and technological inventions and innovations in production methods. Within a few years of the end of the Second World War the automotive industry had grown to become the most important mass consumption good, and had generated a lot of employment in the production of passenger cars, trucks, bicycles, motorcycles and trams.

Aladenusi (2011) states that automobile assembly plants in Nigeria were established among other things to transfer technology, establish viable support industry meant to raise the level of local content in production, creation of employment and contributing to the overall economic development of the country. The industry witnessed a lot of challenges which include: recession due to the structural Adjustment Programme of 1983-84, lack of consistent policy guidelines, disappearance of middle class which is a major market segment and preference for imported vehicles account for the decline state of the industry (Federal Government Gazette No. 28/1984). The major setbacks to the automobile industry could therefore be; the issues of aggregate demand, absence of support infrastructure and ancillary industries of iron and steel and petrochemical and power. The demand for automobiles in Nigeria has continued to increase, especially following the collapse of the rail transport system in the midst of undeveloped inland water ways and a very high cost of air transport which is also plagued by high rates of mishaps. Assorted brands and models of automobiles therefore abound today on the Nigerian roads, used for either public or convenience/luxury of personal transportation (Wheel, 2009).

However, most of these automobiles were imported Completely Built-Up (CBU) either as new vehicles or fairly used ones popularly called “Tokubo” (MB-ANAMCO, 2003). Others were imported as Completely Knocked down (CKD) parts which are then assembled in the country with little local input in parts (Nna, 2001). The automobiles therefore, come in with a wide range of classical and new technologies. A recent national policy banning the importation of automobiles that are more than eight years from their dates of manufacture has however, restricted their importation to mostly those into which technologies have been incorporated. However, one may say that expected growth in automobile firms include among other things, production of functional vehicles, employment generation, increase in market share, increase in sales volume, acquisition, business expansion, increase in profitability, returns on investment, general increase in business activities and contribution to growth of national economy. Looking ahead, automotive assembly is identified as a promising sector in which to boost backward linkages. There is potentially a very large market in Nigeria for manufacturing and supply of local parts and accessories, given the large number of cars, estimated at 10 million – on Nigerian roads (Government of Nigeria, 2014).

The National Automotive Council (2014) estimates that up to 210,000 indirect jobs could be created in small and medium-sized enterprises (SMEs) supplying assembly plants in the Nigerian automotive industry. Projections from PwC (2016) suggest Nigeria could undertake actual manufacturing of vehicles using locally sourced components by 2050, potentially building more than 6 million new cars. While the Nigerian Automotive Industry Development Plan envisages that vehicle assembly will initially entail most vehicle parts being imported, it anticipates that, over time, as local suppliers develop capabilities, specific parts will be manufactured locally which will not only increase the production capacity of the automotive industry but will generate employment opportunities for our teeming youths across the country (Jalal, 2014). Automotive industry has some firms that are working together which could generate a lot of employment in the areas of welded parts (exhaust systems, seat frames); Electric parts (batteries, traffic indicators, wiring harnesses); Plastic and rubber parts (tyres, tubes, fan blades, seat foam, oil seals, hoses, radiator grills); and Radiator, cables, filters, brake pads/linings, windscreens, fibre-glass parts and paint. In addition, the National Automotive Council (2014), argues there are already strong opportunities to increase local content in the tyre industry. Whereas local producers meet around 75% of total tyre demand, and many producers sourced rubber from their own plantations located within Nigeria which will also increase productivity in rubber plantations and create more jobs.

Therefore, given the above backdrop, this study seeks to examine the impact of industry output and employment creation in automotive industry on economic growth in Nigeria. Hence, this paper is structured into five sections. Section 1 presents the introduction to the paper; section 2 is the empirical review, while section 3 presents the methodology used in the paper. Section 4 presents results and interpretations, while section 5 concludes the paper.

EMPIRICAL REVIEW

Scholars who have examined the relationship between productivity and economic growth as well as employment generation and economic growth are numerous. For the productivity and economic growth, Liu & Wu (2019) examined the transmission mechanism between tourism productivity and economic growth using Spain as an empirical setting. The study employed Bayesian dynamic stochastic general equilibrium model for the first time in the tourism literature by relaxing and integrating the assumption of diminishing return of capital into a new growth theory. The results revealed the impact of tourism productivity on economic growth and illustrate the spill-over effects between tourism and other sectors caused by the externalities of physical and human capital and public services. The simulation results further disclose that when the productivity of the overall economy improves, inbound tourism demand expands more than domestic tourism demand, whereas when the productivity of the tourism sector improves, domestic tourism consumption increases more than inbound tourism consumption. Nakamura, Kaihatsu & Yagi (2019) examined the relationship between productivity improvement and economic growth, lessons from Japan. The study identified two reasons behind the productivity slowdown in Japan which include, technology and ideas accumulated by research and development and management resources such as capital and labour are not utilized efficiently, these resources are not efficiently reallocated across corporations. They deduced from the study that to improve Japan's productivity in the medium to long-term, it is desirable to encourage the flexible reallocation of management resources such as capital and labour by changing working process at the corporate level following changes in the socio-economic environment and the advent of new technologies, as well as by improving efficiency in the labour and capital markets.

Lee & McKibbin (2018) explored the historical experience of productivity growth in the Asian economies over recent decades, with a focus on the service sector. Based on this historical experience, their study evaluates the impact of more rapid growth in labor productivity in the service sector in Asia using an empirical general equilibrium model that allows for goods and capital movements across sectors and economies, and consumption and investment dynamics. The study revealed that faster productivity growth in the service sector in Asia contributes to the sustained and balanced growth of Asian economies, but the dynamic adjustment is different across economies. In particular, during the adjustment to higher services productivity growth, there is a significant expansion of the durable manufacturing sector that is required to provide the capital stock that accompanies higher economic growth. Also, Auzina-Emsina (2014) analyzed the impact of changes in labour productivity and its effect on the nation’s global competitiveness. The research focused on the European Union countries that experienced the most severe crisis and afterward the most rapid recovery in the post-crisis period (as Latvia, Lithuania, and Estonia). The research findings showed that there are weak or no relationship between productivity increase and economic growth in the pre-crisis period and the first phase of the post-crisis period; however, the increase of productivity during the crisis is a significant driver of the economy after some time.

Lam & Shiu (2010) studied the relationships between economic growth, telecommunications development, and productivity growth of the telecommunications sector in different countries and regions of the world. Particularly, the study assessed the impact of mobile telecommunications on economic growth and telecommunications productivity employing panel data and granger causality. The results indicate that there is a bidirectional relationship between real gross domestic product (GDP) and telecommunications development (as measured by teledensity) for European and high-income countries. However, when the impact of mobile telecommunications development on economic growth is measured separately, the bi-directional relationship is no longer restricted to European and high-income countries. The study also finds that countries in the upper-middle-income group have achieved a higher average total factor productivity (TFP) growth than other countries. Countries with competition and privatization in telecommunications have achieved a higher TFP growth than those without competition and privatization. The diffusion of mobile telecommunications services is found to be a significant factor that has improved the TFP growth of the telecommunications sector in Central and Eastern Europe (CEE).

Similarly, Cao & Birchenall (2013) examined the role of agricultural productivity as a determinant of China's post-reform economic growth and sectoral reallocation. The study employed microeconomic farm-level data, treated labour as a highly differentiated input, they found out that the labour input in agriculture decreased by 5% annually and agricultural TFP grew by 6.5%. Also, using a calibrated two-sector general equilibrium model, they found out that agricultural TFP grew to: (i) account for the majority of output and employment reallocation toward non-agriculture; (ii) contribute (at least) as much to aggregate and sectoral economic growth as non-agricultural TFP growth; and (iii) influence economic growth primarily by reallocating workers to the non-agricultural sector, where rapid physical and human capital accumulation are currently taking place.

Shahiduzzaman & Alam (2014) investigated the role of investment in information technology (IT) on economic output and productivity in Australia over about four decades. Employing aggregate production function framework, where IT capital is considered as a separate input of production along with non-IT capital and labour. The empirical results from the study indicate the evidence of robust technical progress in the Australian economy in the 1990s. IT capital had a significant impact on output, labour productivity, and the technical progress in the 1990s. In recent years, however, the contribution of IT capital on output and labour productivity has slowed down. Regaining IT capital productivity, therefore, remains a key challenge for Australia, especially in the context of greater IT investment in the future. While Gerdin (2002) analyzed the patterns of productivity and economic growth in the aggregated Kenyan agriculture between 1964 and 1996. In the 1964–1973 period, the average output growth exceeded 4% but stagnated to an average of 1.2% during 1988–1996. Over the whole period, capital was the most important contributor to output growth. Mean growth rates of intermediate inputs subsequently decreased and were negative in 1988–1996. Labour was the least significant source of growth. The mean total factor productivity growth was less than 0.4% and decreased over time. The contribution of productivity growth to output growth increased from 10.2% in 1964–1973 to 26.8% in 1988–1996.

On the other hand, employment generation and economic growth related literature include; Nasr-Allah, Gasparatos, Karanja, Dompreh, Murphy, Rossignoli & Charo-Karisa (2020) assessed employment generation along the different stages of the aquaculture value chain in the main governorates that are responsible for about 80% of the Egyptian aquaculture production. In particular, it analyzed data from surveys in hatcheries (N=40), feed mills (N=14), fish farms (N=234), and fish trading and retailing (N=182) as a proxy of employment generation patterns for the entire sector. The study showed that aquaculture generates 19.56 Full-Time Equivalent (FTE) jobs per 100t of produced fish along the entire value chain. However, most of these jobs are generated for males over 30 years of age, with few jobs for females or younger people. Most jobs for females are currently generated at the retailing stage. Boosting employment generation across the entire value chain, especially for females and the youth, can contribute to the attainment of multiple Sustainable Development Goals (SDGs) such as SDG 8 and SDG 5.

Kim, İlkkaracan & Kaya (2019) examined public investment in care services in Turkey as a way of promoting employment & gender-inclusive growth. The study employed a macro-micro simulation model to examine the aggregate and gender employment impact of increasing public expenditures on ECEC services, an underdeveloped sector in Turkey versus physical infrastructure and construction, a common target of stimulatory spending. The methodological approach combines input-output analysis on aggregate employment effects with a statistical microsimulation approach to assess distributional outcomes. The results show that an expansion of ECEC services creates not only significantly more jobs but also does so in a more gender-equitable and fiscally sustainable way than a construction boom. Likewise, Bohlmann, Horridge, Inglesi-Lotz, Roos & Stander (2019) examined the long-run regional economic effects within South Africa of changing the electricity generation mix towards less coal. The study employed a regional Computable General Equilibrium (CGE) model of South Africa and the overall result stemmed from all scenarios suggest that the effect of a transition to an energy supply mix with a smaller share of coal generation is sensitive to other economic and policy conditions, in particular, the reaction of the global coal market and hence, South Africa's coal exports. Under conditions in which surplus coal resulting from lower domestic demand cannot be readily exported, the economies of coal-producing regions in South Africa such as the Mpumalanga province are the most severely affected. The subsequent migration of semi-skilled labour from that province to others within the country requires appropriate and timeous planning by energy policymakers and urban planners.

Liu, Park, Yi & Feiock (2020) empirically evaluates the employment impact of Florida county recycling programs from 2000 through 2011, applying a fixed-effects regression model. The results indicate that a one percentage point increase in the county recycling rate leads to a 0.4% job growth in the overall solid waste and recycling industry. However, the impact of recycling programs on green jobs is not uniform across the recycling subsectors: the effect is concentrated in the recycling processing sector while the solid waste collection sector and scrap materials businesses are unlikely to be influenced by the county's recycling performance.

It can be deduced from the above literature that most of the previous works done on productivity, employment generation, and economic growth are sectorial analysis. While most of them concentrated on sectors such as agriculture, telecommunication and ICT, tourism, hospitality or care services and general industrial activities, few or no research paper within our reach examined automobile industry products as well as employment generation aside from Chakrabarti (2018) who specifically analyze changes in non-agricultural private sector employment over 10 years (2003–2012) across 25 states in response to changes in the density (lane-km per unit area) of national highways, controlling for other factors affecting employment. Using a series of static (pooled ordinary least squares, random-effects and fixed effects) and dynamic (random- and fixed-effects with first-order autoregressive or AR (1) disturbances, and system GMM or generalized method of moments) panel regressions, the study finds that 10% increase in national highway density in India is associated with 1–6% (depending on the model specification and estimation approach) increase in private sector employment, all else equal.

The author provides first empirical evidence suggesting that India's national highway development efforts have produced positive employment benefits in the past. In addition to contributing to transportation planning scholarship, the findings are expected to inform policy-makers in India as they develop future highway investment plans aimed, in part, at economic development. Hence, amid dearth literature on the productivity and employment generation in the automobile industry, this study fills the gap in the existing literature and provide the specific result on the relationship between or among the variables.

RESEARCH METHODOLOGY

Theoretical Framework

Solow's (1957) pioneering contribution to growth theory has generated the theoretical basis for growth accounting. In this neoclassical view, we can thus decompose the contribution to output growth of the growth rates of inputs such as technology, capital, labor, inward FDI, or by incorporating a vector of additional variables in the estimating equation, such as imports, exports, institutional dummies etc. The growth accounting approach can be derived from the following equation:

$$Y = A(K, L, \Omega) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where Y, K, L, and A are output, capital, labor, and the efficiency of production, respectively; and Ω is a vector of ancillary variables. Assuming, for example, a Cobb-Douglas form, and taking the logarithms and time derivatives of equation (1) yields:

$$g_Y = g_A + \alpha g_k + y\beta_\Omega \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where g_Y is the rate of growth of $A, K, L, \ \Omega$ (the subscripts are defined in per capita terms), and α, β,γ are, respectively, the elasticities of output with respect to physical capital, labor and the ancillary variables. It is worthy to note that there is a very big gap between the market supply in automotive industry and market demand of which increase in automotive productivity have to bridge and by so doing, more employment will be created and it will have positive overall effects of Nigeria economy.

Model Specification

Following the study of Arosanyin, Olowosulu and Oyeyemi (2011) who examined employment generation and determinants of earnings in the informal transport sector in Nigeria, their model is modified by including some variables such as Industrial Output (OUT) and Employment (EMP), in automotive industry in Nigeria.

Hence, the model for this study is formulated as follows;

$$RGDP = f(OUT, EMP, EXCR, INTR \,\&\, INFR) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 3$$

Equation 3 can be transformed into an econometrics model as thus;

$$RGDP_t = \alpha_0 + \alpha_1 OUT_t + \alpha_2 EMP_t + \alpha_3 EXCR_t + \alpha_4 INTR_t + \alpha_5 INFR_t + \mu_t \ldots\ldots\ldots\ldots\ldots..4$$

Where; $RGDP$ is Real Gross Domestic Product

OUT is the Industrial Output from Automotive Industry; EMP is Employment Generation in the Industrial Output from Automotive Industry; $EXCR$ is Exchange Rate; $INTR$ is Interest Rate; $INFR$ is Inflation Rate and μ is the Error Term. Based on the theoretical framework and results from the empirical review, it is expected that α_1 and $\alpha_2 > 0,\ \alpha_4\ and\ \alpha_5 < 0,$ while $\alpha_3 > or < 0$.

The Data

Secondary data was collected from Peugeot Automobile Nigeria Limited (PAN), 1987-2019 and Central Bank of Nigeria 2018 Bulletin, Volume 9. The reason for using time series in this model is that the Industrial Output, Employment, Exchange Rate, Interest Rate and Inflation Rate used as independent variables with Real Gross Domestic Product as dependent variable are variables that change over time.

Estimation Techniques

ARDL Model

ARDL model enables the study to test for Co-integration among the variables in the model through the help of Bound Test. This is done in order to ascertain the level of long run relationship among the variables in the model. The Autoregressive Distributed Lag (ARDL) version of the model is formulated as follows:

$$\begin{aligned} RGDP_t = \; & a_0 + \sum_{i=1}^{a} (\partial_0 \mathrm{RGDP_{t-1}}) \\ & + \sum_{\mathrm{i=0}}^{\mathrm{b}} \partial_1 \mathrm{OUT_{t-1}} + \sum_{\mathrm{i=0}}^{\mathrm{b}} \partial_2 \mathrm{EMP_{t-1}} + \sum_{\mathrm{i=0}}^{\mathrm{c}} \partial_3 \mathrm{EXCR_{t-1}} + \sum_{\mathrm{i=0}}^{\mathrm{d}} \partial_4 \mathrm{INTR_{t-1}} + \sum_{\mathrm{i-0}}^{\mathrm{e}} \partial_5 \mathrm{INFR_{t-1}} \\ & + \partial_6 \Delta \mathrm{RGDP_{t-1}} + \partial_7 \Delta \mathrm{OUT_{t-1}} + \partial_7 \Delta \mathrm{EMP_{t-1}} + \partial_8 \Delta \mathrm{EXCR_{t-1}} + \partial_9 \Delta \mathrm{INTR_{t-1}} \\ & + \partial_{10} \Delta \mathrm{INFR_{t-1}} + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 5 \end{aligned}$$

Error Correction Model (ECM)

If the series are further co-integrated, then it will be most efficiently represented by an error correction method, which is used to tie short run behaviour of the variables to its long-run values. Engel and Granger (1987) stipulated that the ECM will correct disequilibrium error and is of the form:

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_t + \alpha_{2t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

Where: Δ denotes the first difference,

U_t is the one period lag value of the residual from the regression equation; α the empirical estimate of the equilibrium term and ε is the error term. The unrestricted ECM model was used from which we obtain efficient lag-length necessary for estimation for ARDL model thus:

$$RGDP_t = a_0 + \sum_{i=1}^{a}(\partial_0 \mathrm{RGDP}_{t-1}) + \sum_{i=0}^{b}\partial_1 \mathrm{OUT}_{t-1} + \sum_{i=0}^{b}\partial_2 \mathrm{EMP}_{t-1} + \sum_{i=0}^{c}\partial_3 \mathrm{EXCR}_{t-1} + \sum_{i=0}^{d}\partial_4 \mathrm{INTR}_{t-1} + \sum_{i-0}^{e}\partial_5 \mathrm{INFR}_{t-1} + \mathrm{ECM}_{t-1} + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 7$$

ANALYSIS AND RESULTS

Summary Statistics

Table 1: Descriptive Statistics

	GDP	PDT	EMP	EXCR	INTR	INFR
Mean	36370.69	10.31891	912.0909	343.9815	18.98030	19.87273
Median	13301.56	9.420000	1082.000	402.2500	17.98000	12.22000
Maximum	153624.6	27.73000	2250.000	787.9800	29.80000	72.84000
Minimum	249.4391	0.500000	174.0000	16.35000	13.54000	4.070000
Std. Dev.	43844.48	7.482671	523.3755	240.2236	3.426449	18.33461
Skewness	1.125983	0.561452	0.029952	-0.075235	1.503383	1.602969
Kurtosis	3.119992	2.479348	2.565221	1.572391	5.117151	4.200904
Jarque-Bera	6.992910	2.106489	0.264854	2.833475	18.59408	16.11528
Probability	0.030305	0.348804	0.875967	0.242504	0.000092	0.000317
Sum	1200233.	340.5240	30099.00	11351.39	626.3500	655.8000
Sum Sq. Dev.	6.15E+10	1791.692	8765501.	1846636.	375.6977	10757.06
Observations	33	33	33	33	33	33

Table 1 presents the summary statistics of the variables under study, and each variable is presented to have 33 observations. The variables are; Gross Domestic Product (GDP), Productivity (PDT), Employment (EMP), Exchange Rate (EXCR), Interest Rate (INTR), and

Inflation Rate (INFR). The table shows that GDP has the highest mean value, followed by the data on Employment, Exchange Rate, Inflation Rate, and Productivity respectively. The individual Normality test of Jarque Bera method shows that PDT, EMP, and EXCR are normally distributed over the years, while the data obtained on GDP, INTR, and INFR do not pass the normality test given that their J-B probability values are less than 0.05 level of significance. Comparably, the Kurtosis values of these variables support the output of Jarque-Bera test as the PDT, EMP, and EXCR appear to be platykurtic, given that their value is less than three, while GDP, INTR and INFR are Mesokurtic as their Kurtosis values are greater than three.

Unit Root Test

Many at times, time-series data exhibit non-stationary property, every researcher desires to ensure the data employed for analysis are stationary to avoid spurious regression results. In a bid to satisfy this goal, the unit root test is therefore conducted to examine the nature of each variable of interest as their order of integration would be revealed, and that also gives a clear direction on the technique or method of regression analysis that is appropriate for the study.

For this study, our unit root test would be limited to the Augmented Dickey-Fuller and Phillip-Peron methods. The order of integration or the stationarity property of each variable is presented in table 2.

Table 2: Unit Root Test

Variables	**Augmented Dickey-Fuller (ADF) Test**			**Phillip-Perron (PP) Test**		
	At Level	At First Difference	Order	At Level	At First Difference	Order
LGDP	-3.902595***	-3.090387***	I(0)	-3.495721***	-3.068114***	I(0)
PDT	-2.109927	-5.495325***	I(1)	-2.006447	-10.40308***	I(1)
EMP	-2.450835	-8.580926***	I(1)	-2.363330	-8.580926***	I(1)
EXCR	-1.544839	-5.491989***	I(1)	-1.546806	-5.491989***	I(1)
INTR	-4.174370***	-3.224519**	I(0)	-4.407250***	-10.49160***	I(0)
INFR	-3.318211**	-6.158048***	I(0)	-2.949472*	-8.612534***	I(0)

Asymptotic Critical Values				
1%	-3.484198	-3.484198	-3.484198	-3.484198
5%	-2.885051	-2.885051	-2.885051	-2.885051
10%	-2.579386	-2.579386	-2.579386	-2.579386

* represents significance @10% level, ** represents significance @5% level, and *** represents significance @1%.

Table 2 reveals the stationarity properties of each variable under study using Augmented Dickey-Fuller and Phillip Perron methods. The output shows the suitability of Autoregressive Distributed Lag Model (ARDL) as the appropriate long-run cum short-run regression method of analysis for this study as their stationarity properties reveal a mixture of I(0) and I(1) i.e they are either integrated of order zero(0) or integrated of order one(1). Contrary to the orthodox methods of Johansen's test (Johansen 1991), and Vector Autoregression, in this case, ARDL technique of regression analysis can be employed to explore the long-run and short-run relationship in the dynamic model, having explored and satisfied the stationarity requirement of the explicative and dependent variables. We can, therefore, proceed to explore if a long-run relationship is established among the variables by conducting the F-Bounds Test for cointegration. The result of the ARDL Long run Bounds Test is also presented in table 3.

F-Bounds Test for Cointegration in ARDL

Table 3: F-Bounds Test Result

	90%		95%		97.5%		99%	
	Lower Bound	**Upper Bound**	**Lower Bound**	**Upper Bound**	**Lower Bound**	**Upper Bound**	**Lower Bound**	**Upper Bound**
F-statistics	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
83.88056***	2.08	3.0	2.39	3.38	2.7	3.73	3.06	4.15

From Table 3, it is revealed that the F-statistic value (83.88056) is higher than the asymptotic values at all levels of confidence including the upper bound at 1% level of significance or 99% level of confidence. The result mirrors evidence that the variables of interest exhibit long-run relationships or they are cointegrated. It implies long-run joint reversion of the variables to the position of equilibrium. Also, this result approves the applicability of the ARDL model specified for this study.

Lag Selection Criteria

Figure 1 shows the ARDL lag selection as suggested based on the Akaike Information Criteria (AIC). The graph suggests ARDL (1, 1, 0, 2, 0, 0) as the most efficient and suitable lag structure for the specified dynamic model in this study.

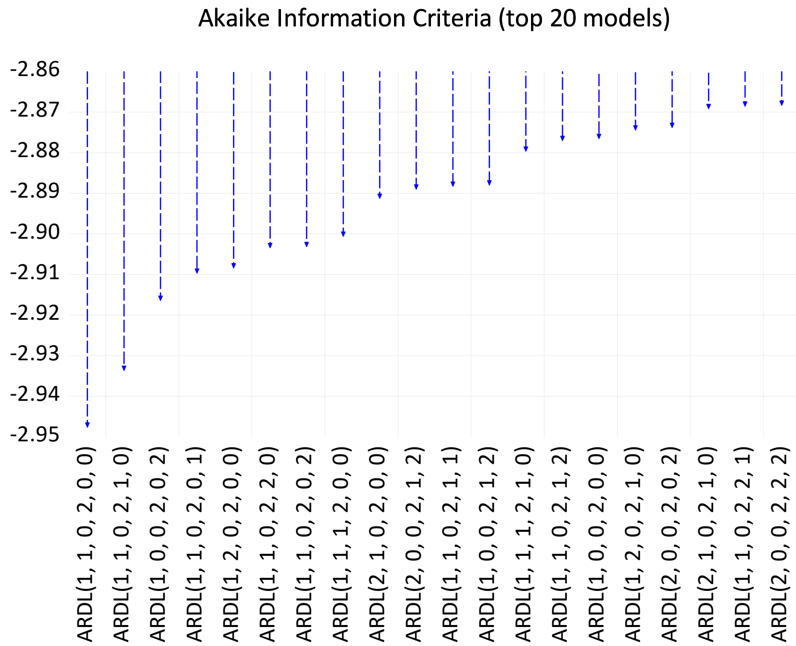

Figure 1: AIC Lag selection

Estimated Long-Run and Short-Run ARDL Model

The dynamic model on the impact of productivity and employment on economic growth is therefore estimated and presented in Table 4.

Table 4: Estimated Long-Run and Short-Run ARDL Model (E-views version 11 output)

Estimated Long-Run Outputs of ARDL (1, 1, 0, 2, 0, 0) Based on AIC suggestion				
The regressand is $LGDP$				
Regressor	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
$LGDP_{t-1}$	1.062096	0.019800	53.64122	0.0000***
PDT	0.006135	0.002273	2.699085	0.0134**
PDT_{t-1}	-0.003689	0.002112	-1.746629	0.0953*
EMP	0.000152	4.90E-05	3.098261	0.0054***
$EXCR$	8.72E-05	0.000106	0.824607	0.4189
$EXCR_{t-1}$	9.26E-05	0.000130	0.711362	0.4847
$EXCR_{t-2}$	-0.000271	0.000117	-2.317663	0.0306**
$INTR$	0.010156	0.003676	2.763064	0.0117**
$INFR$	0.005626	0.000779	7.218901	0.0000***
C	-0.802036	0.234007	-3.427409	0.0025***
Estimated Short-Run Outputs of ARDL (1, 1, 0, 2, 0, 0) Based on AIC suggestion				
$D(PDT)$	0.006135	0.001503	4.082799	0.0005
$D(EXCR)$	8.72E-05	8.12E-05	1.073223	0.2953
D(EXCR(-1))	0.000271	8.06E-05	3.360680	0.0030
$CointEq(-1)*$	-0.062096	0.002260	-27.47590	0.0000

Table 4…

R Squared	= 0.999497	Adjusted R-Squared = 0.999281
S.E. of Regression	= 0.048786	F-statistic (Prob.) = 4632.537 (0.000000)

Diagnostic Tests

Test Statistics	**LM Result**	
A. Serial Correlation	X^2_{auto}	= 0.889752(0.4272)
B. Functional Form (Ramsey Reset)	X^2_{RESET}	= 0.480689 (0.4961)
C. Normality	X^2_{Norm}	= 3.741335 (0.154021)
D. Heteroscedasticity	X^2_{Het}	= 0.838484 (0.5900)

Note: ** and * indicate significance at 1% and 5% level of significances.

Figures in parenthesis are probability values. A is Breusch-Godfrey Serial Correlation LM Test, B is Ramsey's RESET test, C is Normality Test, D is Heteroscedasticity test.

Normality Tests

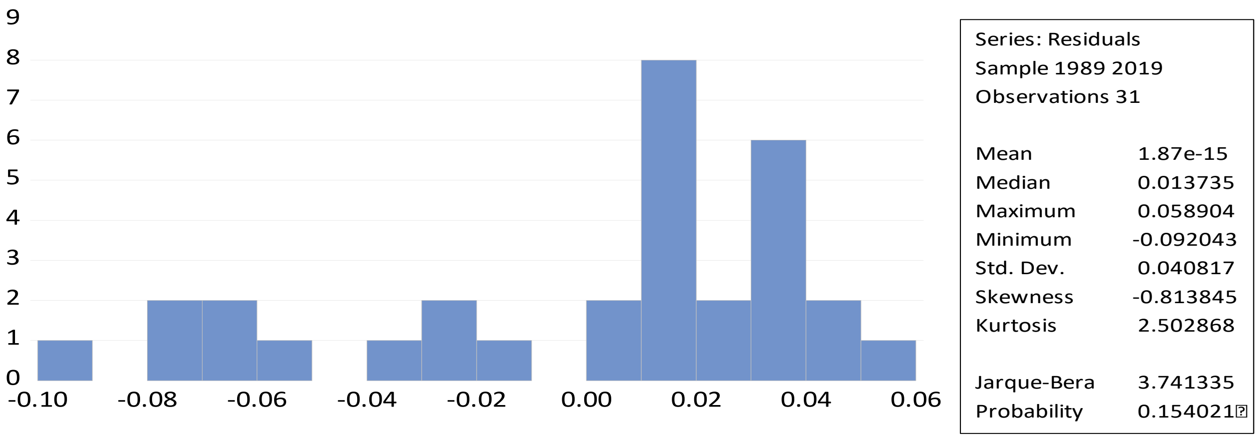

Figure 2 (A): Normality Test Graph

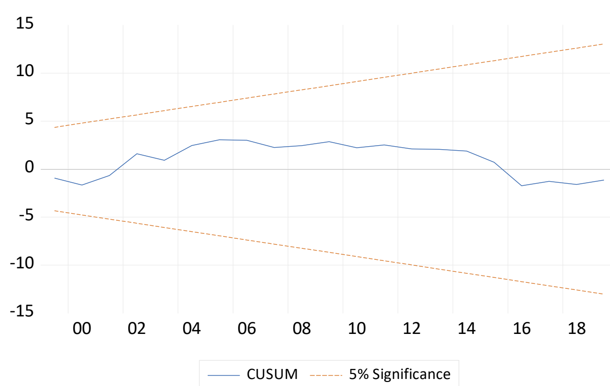

Figure 2 (B): CUSUM Test Graph

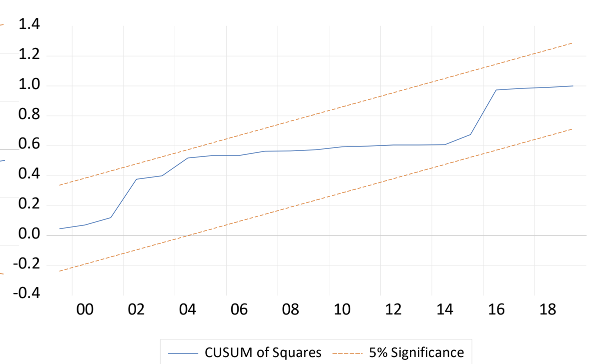

Figure 2 (C): CUSUM of Squares Test Graph

Interpretation of the Results

The result of long-run ARDL estimated coefficients presented in table 4 reflects the individual impact of the selected explanatory variables on the target variable. For the autoregressive part of the model, the selected lag value of LGDP appears statistically significant in determining the contemporaneous value. A percentage increase in one period lag of LGDP leads to a 1.062096 percent change in its current or contemporaneous value. The current values of Productivity (PDT), as policy variable, Employment (EMP), two-period lag of Exchange rate ($EXCR_{t-2}$), Interest rate (INTR), and Inflation rate (INFR) also show a statistically significant impact on the regressand. More detailed, a unit increase in PDT, EMP, $EXCR_{t-2}$, INTR and INFR leads to 0.006135%, 0.000152%, -0.000271%, 0.010156% and 0.005626% change respectively in LGDP. In the short-run version of the estimated model, the first part explains the individual short-run effect of the selected variables on the explained variable. The Productivity variable (PDT), and a period (a year) lag of EXCR are revealed to be statistically significant in determining the target variable. A unit increase in D(PDT) and D(EXCR (-1)) leads an 0.006135% and 0.000271% increase in LGDP respectively. However, the second phase of the short-run analysis reveals the percentage of the variables speed of adjustment back to a position of equilibrium annually, and this is revealed by the ECT(-1) coefficient of -0.062096, which shows that the speed of reversion of these variables annually is 6%. The negative value of the ECT(-1) is a reflection that our model is also good for prediction.

Evidence from the result of R^2 (0.999497) and the Adjusted R^2 (0.999281) informs that the specified dynamic model has a good fit. It implies that 99% variation in the regressand is explained by the features. In addition, having considered the degree of freedom, the adjusted-R^2 authenticates the goodness of the model's fit, where the explicative variables are still responsible for the 99% of the variation in the target variable. The overall statistical significance of the explicative variables in determining the explained variable is presented by the F-statistic result, F-statistic (Prob.) = 4632.537 (0.000000); a reflection of joint significance of the specified model and its suitability for reliable prediction of the future LGDP's behavior.

Jarque Bera test (prob) in Figure 2(A) = 3.741335 (0.154021); Serial Correlation Test = 0.889752 (0.4272); Heteroskedasticity Test = 0.838484 (0.5900); Ramsey RESET test for specification = 0.480689 (0.4961). The results show the normality of the residuals' distribution, the freedom from serial correlation, heteroskedasticity, and multicollinearity menace. The reset test also approves the dynamic model as a well-specified model. Similarly, our stability tests of Cusum and Cusum of squares show the model is stable as the residuals in both cases do not fall outside the 5% boundaries. Wholly, we can conclude that our model is statistically dependable for analysis and forecasting.

CONCLUSION AND RECOMMENDATIONS

Conclusively, the obtained regression results explain that the policy variable (i.e Economic Growth) impacts the target variables (i.e. Industrial Output and Employment Generation in Automotive Industry) positively, and the diagnostic tests approve of the model's reliability for forecasting and prediction. Based on the findings, it is therefore recommended that government needs to support the Automotive sector in Nigeria. The study shows that productivity and employment rate in this sector are positively related to the growth of the economy though the percentage of their contributions is minimal. This is due to high importation of Semi Knocked Down (SKD) rather than Completely Knocked Down (CKD) in Nigeria. Bringing more of CKDs rather than SKDs into the country will boost activities in the vehicle manufacturing thereby increasing productivity and employment rate in the industry.

Another factor that can guarantee maximum contribution of productivity and employment rate in the automotive industry in Nigeria is government support towards patronage of the locally manufactured vehicles and other automotive related products. Generally, the average income earnings of workers are low. No worker can afford to buy brand new vehicles. This is responsible for why many buy fairly used vehicles rather than new ones except few corporate organizations that patronize them. However, there is no strict policy and law forbidden even government at all levels from importing fully built vehicles. Therefore, government at all levels import directly fully built vehicles and this is responsible for why contribution of automotive sector in Nigeria to economic growth in the country is low. Government needs to raise highly tariff against importation of fully built vehicles as done in other countries. Local Vehicle Manufacturers need be restricted to importation of CKDs rather than SKDs.

Technology transfer needs be made a priority by ensuring that foreign parts manufacturers to vehicle producers are given incentives and support by law to set up plants in Nigeria or collaborate with the existing parts manufacturers across the countries. Government needs to provide enabling environment through policies and laws that will give confidence and guarantee the investments of the Original Equipment Manufacturers (OEMs) that are willing to bring their investments into the country.

Also, political instability and other social vices such as banditry, kidnapping, terrorism, need to be curbed to the barest minimum. If all the issues enumerated above are addressed, the positive contribution of industrial output and employment in the automotive industry in Nigeria to the national economic growth will be sustained both in the short and long run periods. Once all these are done, there shall be favourable Exchange Rate foreign exchange conservation, inflation will decline, aggregate demand will increase thereby encouraging Foreign Direct Investment (FDI) and the multiplier effect will increase the fortunes of the country in all the sectors because automotive industry is a linkage to other manufacturing industries such as steel, rubber, plastic, petrochemical and oil, among others.

The scope for further studies shall examine the impact of Sales Volume and Completely Knocked Down Components on the Real Gross Domestic Product (i.e. Economic Growth) in Automotive Industry in Nigeria from 1987-2019

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