# CONFERENCE PROCEEDINGS

## NATIONAL CONFERENCE ON SUSTAINABLE ECONOMIC DEVELOPMENT

THEME:
ADVANCING SUSTAINABLE ECONOMIC DEVELOPMENT STRATEGIES IN NIGERIA

**ALEX EKWUEME FEDERAL UNIVERSITY**
**NDUFU-ALIKE - EBONYI STATE**

**27TH - 28TH APRIL, 2023**

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# NATIONAL CONFERENCE ON SUSTAINABLE ECONOMIC DEVELOPMENT

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# NATIONAL CONFERENCE ON SUSTAINABLE ECONOMIC DEVELOPMENT

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**DAY TWO – FRIDAY 28TH APRIL, 2023**

**OPENING SESSION/PLENARY**

| | |
|---|---|
| Conference Registration | - 9:00am – 10:00am |
| Opening Prayer/Welcome Remark | - 10:00am – 10:15am |
| Institutional Brief/Chairman's Opening Remark | - 10:15am – 10:30am |
| Plenary Session | - 10:30am – 4:00pm |
| Policy Review Session | - 4:00pm – 5:00pm |

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# CONTENTS

# Contents

# Book of Proceedings

# Industrialization as Imperative for Sustainable Economic Development in Nigeria

**[1]Okorontah Chikeziem F. & [2]Uruakpa Chiagoziem G.**
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**Abstract**

There is very strong evidence in support of industrialization as a key determinant of economic growth/development in the developed economies. This evidence is also manifesting in many developing nations as recorded in many literatures and as we practically see some developing nations migrating from agrarian economy or mono economy to industrial led economy or diversified economy. This study is on industrialization as imperative for sustained economic development in Nigeria. It examines Nigerian's industrial policy and economic performance focusing on the analysis of the structural changes in its manufacturing sub- sector associated with some key policy options since after independence. The aim of the study is to show how the industrial sector, or the manufacturing sub-sector in particular has contributed to the growth/development of the economy. It combined descriptive/trend analysis and also econometric analysis (through the use of unit root test and ordinary least square technique) for its empirical study and found that the manufacturing sub-sector though significant in its relationship with economic growth has not contributed enough towards economic development of the nation. It also found that many of the policies that Nigerian government has adopted over the years that yielded little or no result are the same policies some developed nations adopted that made them what they are today. This means that Nigeria authorities know what to do but has failed to do it right. The policy implication is that the road to Nigerian's industrialization has been discovered, but for Nigeria to join the rest of the developed world (as regards sustainable economic development) requires a change in the mindset of the people which can only be possible through a holistic and revolutionary change in governance and overhauling of the institutional framework at all levels of government.

**Keywords:** *Industrialization, Economic Development, Manufacturing, Nigerian economy, Re-orientation.*

**Background to the Study**

At independence in 1960, the nature of the Nigeria economy was still agrarian and underdeveloped as the colonial master (Britain) did little or nothing towards industrialization in Nigeria (Banjoko et al 2012). For instance, the contribution of manufacturing to total gross domestic product (GDP) in 1960 was 3.2% (CBN 2020,). Agricultural production dominated economic activities accounting for 63 per cent of total GDP and 80% of export earnings (Ekpo 2014). This scenario perverted because the foreign companies (mainly from Britain) concentrated in trade and commerce especially in the exportation of Nigeria's primary goods and importation and distribution of goods manufactured in Britain and some other countries. With this understanding and knowing that developing countries need more industries especially manufacturing industries to promote economic growth and development to an optimal level (Olusegun 2021), Nigeria immediately put-up measure and policies towards industrialization. This is because of the fact that industries have been recognized to be an important indicator of economic growth as marginal revenue products of labour in industries are higher than that of the agricultural sector (Todoro & Smith 2020, Jelilov et al 2016). Also, evidence abound, showing that many cases of high rapid and sustained economic growth in modern economies are associated with industrialization especially growth in manufacturing production (Szirmai, 2009).

The objectives of most industrial policies/industrialization strategies are to increase the rate of industrial development through innovations by radically increasing the value added at every stage of the production process and to achieve economic growth, full employment and balance of payment equilibrium. Indeed, the growth of the economy implies the expansion of all sections of the economy - high levels of production, high standard of living and overall achievement of all the macroeconomic objectives of the economy such as high levels of employment, reduction on inflation and high levels of output (Unugbon 2010). However, for these policies to be fruitful and achieve the desired goal - industrialization, the government must create enabling environments that are conducive for business activities (Diendo 2013; Jehilov, Enwerem & Isik 2016). But the enabling environment that is conclusive for business activities may be hard to be achieved without social and economic equalization, which is rooted and grounded in the promotion of the political, social and economic empowerment of the people through value re-orientation embodied on honesty, rationality, integrity and self-reliance. It is also said that the dynamic benefits of the manufacturing sector are activating economic transformation in modern economies. Industrialization, however, is also responsible for speeding up investment capital in the agricultural sector which brings about agriculture mechanization (Afolabi & Ogoh 2017).

By 1960 the share of manufacturing to total gross domestic production (GDP) was 3.2% and grown to 5.4% and 13% in 1977 and 1992 respectively but fell to 6.2% in 19993. It recorded lower than expected in 2000 and 2013 with meager rate of 4% as 6.5 % as its contributions to GDP. In 2020, the value- added manufacturing as a percentage of GDP rose to 12.67% (World Bank 2022). The contribution of the industrial sector to economic growth is more interesting as its share to GDP in 1981 and 1991 were 51.89% and 54.895 respectively. It however recorded a decree in 2001 with a share to GDP of 44.15% and further in 2011 with a share or 42.86%. This

decrease continued in 2012 and 2013 as it contributed 29.04% and 34.54% to GDP respectively (CBN 2014). In 2021 the contribution of the industrial sector to GDP stood at 31.41%. (https//www.statista.com>). This downfall in the contribution of the industrial sector to GDP (in 2001 through 2023) could be attributed to decline in the output of crude petroleum and material gas occasioned by insecurity in the oil producing areas. These records are striking, one might think that the increase in world oil price during 2011 through 2014 could have made a positive change in industrial sector contribution to GDP. It also suggests that the other sub-sectors of the industrial sector are relatively inactive. Also, the drastic decline in the industrial sector's contribution to the GDP in 2011 is shocking. It implies that the huge amount of fund governments of different regimes had mapped out in their budgets (for such sectors like power, transport, research and development, security etc) to increase and enhance the contribution of the industrial sector to GDP and equally bring a sustainable economic development in the economy as embodied in the vision 2020 are all mere illusion. It is unfortunate that the growth of the Nigerian economy depends more on exogenous factors such as the global oil price, for instance the country experienced negative growth rate of 1.6% in 2016 and 0.8% in 2017 which is attributed to the collapse of international oil price between 2015 and 2018 (UNICTAD 2018).

Nevertheless, for decades past, Nigerian government had formulated and implemented different industrial policies/industrialization strategies in order to facilitate and expand the horizon of industrialization in the economy. Among these policies are import substitution approaches designed to reduce importation of some goods that can be produced locally, export promotion strategies and foreign private investment led industrialization as well as policy reforms such as indigenization, structural adjustment programme (SAP) and national economic empowerment and development strategies (NEEDS). The implementation of these policies or programmes sunk millions or billions of naira. Also, huge public investment were made in the industrial sector with the establishment of industrial research and training institutes to provide the necessary foundation for growth of the industrial sector of the economy by providing the basic engineering infrastructures for the production of raw materials, spare parts, equipment components and machinery needed in the various industrial sites established in different parts of the nation. These include Federal Institute for industrial research (FIIR), Raw Materials Research Development Centre (RMRDC), Industrial Core Project (ICPS) and Project development Agency (PRODA) etc (Okezie, Nwosu & Matcus 2017). With all these laudable efforts put in place towards industrialization, it is expected that the industrial sector should have overcome earlier teething challenges and contribute greater proportion towards the overall economic development or put differently become the driver of the economy. This study lies on the fact of its expectations to finding out the extent to which the industrial sector has contributed towards the sustainability of economic growth/development in Nigeria.

## Literature Review

### Conceptual Issues

An industry may be referred to as a number of firms producing broadly similar commodities. And there are different kinds of industries, ranging from crafting, mining, processing and

manufacturing industries etc. some analysts believe that manufacturing industry is very importance in speeding up industrialization. As Anyanwu (1997) puts it, "Industrialization is the process of building up a nation's capacity to convert raw materials and other inputs to finished good and to manufacture goods for other production or for final consumption. Furthermore, Nwosu (2000) opined that industrialization encompasses the totality of relations involving workers and the states regulatory and interventionist authorities as they mobilize and intensify their effort at appropriate places throughout the country, on a continuing bases to entrepreneurially and managerially organize to make use of machine or technology and other material inputs; with the aim of more efficiently or productively manufacturing more qualities of industrial, agricultural and other capital and consumer goods that are of highest and newer quality. This implies that industrialization is followed by scientific and technological revolution which propels and sustains agriculture revolution (kerr et al 1972). Development is a multi-dimensional process involving positive and progressive changes in structures, attitudes, values and institutions as well as, the reduction of inequality and eradication of absolute poverty (Todaro, 1980). This is possible and is mostly achieved by managing economic growth adequately.

**Theoretical Literature**

From our conceptual literature, industrialization comprises the efforts of the government at all levels on a continuing bases to organize to make use of machines, and other inputs and productively manufacture more qualities of industrial, agricultural and consumer goods that are of higher quality: This spurs the economy into growth and urbanization with improvements in health, human capital, lifespan and standard of living. It is this association of the industrial sector with economic growth and development that prompt economists to formulate industrialization theories.

**Low Equilibrium Trap Theory**

According to this theory, as per capital income remains below a critical level, a population growth rate that exceeds the income growth will always bring the economy back to a low-level equilibrium trap. To escape the low-level equilibrium trap, Nelson, in 1956 gave four steps as.

i. There should be a favourable socio-economic environment in the country.
ii. Measure should be adopted to change the distribution of income.
iii. There should be an all-perverting government investment programme.
iv. Income and capitals should be used to utilize existing resources fully so that income is increased.

**The Unbalanced Growth Theory**

This theory is proponded by Hirschman (1957). He said that a deliberate unbalancing of the economy according to a pre-designed strategy is the best way to activate growth in an underdeveloped nation. This theory assumes that, when a strategic sector is fully developed, it causes the growth of other sectors and the economy will lead to new investment opportunities and so pave way for further economic development, as such growth is being communication from leading sectors of the economy to the followers, (Jhingan, 2011). This theory was adopted by Nigeria in the 1970s – the selective credit policies.

**Theoretical Framework**

One of the four steps of the low equilibrium trap theory is that 'income and capital should be used to utilize existing resources fully so that economic growth should be enhanced. Following this theory, this study adopted the Solow model of production function:

Y = f(K,L), where, Y = Output, K = Input of capital and L = Labour, (Chamberlin & Yuem, 2006). However. The model was modified to fit in the present study by using the function, Y = f(Xi), where Y = GDP (proxy of economic growth) and Xi = the products of capital and labour in various sectors.

**Industrial Policy in Nigeria:**

The quest for industrialization and the reasoning that it is the engine of economic growth and development especially for the underdeveloped and developing countries stimulated the need to formulate policies and programmes that will boast industrialization and bring self-reliance of the Nigerian economy. According to Anyanwu et al (1997), there are two main strategies of early industrialization which are: import substitution industrialization and export-led industrialization strategy. These were the immediate post-colonial policies, meant initially to reduce over-dependence on foreign goods and save foreign exchange. The import substitutes policy was a deliberate industrialization strategy of government aimed at encouraging the production of goods and services hitherto imported. To achieve this, aim the government created tariff walls through the prescription of policies that prohibits the importation of some goods and services intend to be substituted, this is followed by acquiring the technology required to produce such goods and granting export duty incentives and firms and industries to encourage their growth. Unfortunately, this policy failed as it turns out to be a mere assemblage of those items rather than manufacturing them which negated the original aim. Nigeria must have copies this from other countries like Latin American countries who, following the disruption of the flow of imports by the Second World War and depression is the international economy; considered this policy credible: the success recorded by these countries were laudable Wilson, (2002).

On the realization of the pitfalls of the import substitution strategy the government adopted the export promotion strategy which is government industrial policy to stimulate and encourage the production of goods and services mainly for export. This is to be achieved by encouraging domestic industries to increase production of goods and services through tax incentives, reduction of export duties, liberalization of credit etc. There is no much difference between these two policies (import and export-led strategies) because both aimed towards one objective: increasing home production- the former for home consumption and the later for export. However, the policy statements may sound different but there success anchored on one thing – technological transformation which Nigerian was unable to meet up with. It was observed that the 18$^{th}$ century industrial revolutions of many European countries were periods of scientific and technological development that transformed large rural agrarian societies into industrial urban areas, and this has been the dream of Nigeria.

Indigenization in Nigeria is another policy that geared towards promoting the industrial sector as contained in the enterprise promotion decree 1972. It involves government intervention to

acquire and control on behalf of the Nigerian people the greater proportion of the production assets of the country. The main objective was to raise the level of intermediate capital goals production in the domestic economy so as to increase the rate of manufacturing and reduce dependency on foreign made goods (Anyanwu 1993). Unfortunately, the Nigerian Enterprises promotion Decree of 1972 (as amend in 1977 and 1989) was replaced by the Nigerian investment promotion commission in 1996. According to the government, the reason was to attract foreign investment inflow and enhance capacity utilization in production sectors of the economy (CBN 1995). This essentially threw open foreign participation in Nigeria enterprise and therefore a manifestation that the indignation policy failed to achieve the objection of prompting the manufacturing sector.

The early 1980s depicted the true picture of the Nigerian economy which had been emerging in the 1970s – that the Nigerian economy was becoming increasing unstable. The economic scene of Nigeria, the oil boom (1973-74) affected (negatively) nearly all areas of the economy, ranging from investment, production and consumption patterns to social-culturing value, political aspirations, policy options and most regrettable programme implementations. Capital assets hitherto planned to be nurtured and used for massive production in the industrial sector were neglected and maintenance culture virtually eroded and has continued till date as various industrial centers equipped with machines have been abandoned in many states of the nation. All these coupled with financial misappropriation in the public sector resulted to severe fiscal crisis, foreign exchange strategies, high unemployment rate and negative economic growth (Olaniyi 1996).

In response to these economic deteriorations the government first step was to introduce some stabilization, austerity and counter- trade measures between 1982 and 1984. And in 1986 adopted the widely debated programme – the structural adjustment programme (SAP). According to Adeyemi (1996), the theoretical structure of the SSP was predicted on demand management as a measure of curtaining fiscal and external imbalance with a restrictive monetary policy – the ultimate objective was to achieve non-inflationary growth and to stimulate domestic production of tradable goods. As part of the effort to achieve this, the government in its 1986 budget speech regretted the performance and condition of the public enterprises in the country and revealed the desire to privatize or otherwise commercialize them.

The condition of the Nigerian economy since the SAP programme as regards inflation growth gives cudos to both the Chicago and Cambridge schools of economics who maintained that exchange rate flexibility is generally not suitable method for structural change as it has a major consequence or generating inflation (Soludo 1993); also Obadan and Ekuerhare (1993) argued that devaluation has strong precondition which cannot be met by many third World countries but may even worsen their problems. These two policy instruments (exchange rate flexibility and devaluation) were the major policy instruments under SAP even when it was clear that Nigeria has no strong manufacturing base.

It is observed that these programmes were more of huge conduits through which many highly placed people in government and their numerous hangers-on, many well-to-do people in the

amorphous business sector and others who were dubbed consultants had a field day and became strikingly rich. And no one cares to get feedback about the success of these policies/programmes because most of the policies or programmes died off as soon as the government that established them stepped out of office.

## Empirical Review

Vast empirical works on industrialization and economic growth/development have been documented in literature. Below are some selected works in tabular form.

**Table 1.**

| Author(s) | Topic and country of interest | Technique applied | Finding (s) |
|---|---|---|---|
| Khan & Majeed (2022) | The effect of urbanization and industrialization in achieving economic growth without emission (1980-2018) – Pokistan | Impulse response further technique | Industrialization and urbanization are two factors that affect economic growth. |
| Attiah (2019) | Impact of manufacturing and services sector on the economic growth of developing countries (1980 – 2015) – 50 countries. | Descriptive Analysis | Total manufacturing as a ratio to GDP was significant and has a direct relation with economic growth. |
| Ibitoye, Ogunoye & Kleynhans (2022) | Impact of Industrialization on economic growth in Nigeria. | Johanson co-integration and Granger causality Test. | Industrial output has a significant direct effect on gross domestic product (GDP). |
| Sahar (2020) | The effect of Industrialization on economic growth, 1996-2005: Pakistan. | Auto regressive distributed lag (ARDL) | There is a long-term relationship between industrial output and economic growth or GDP. |
| Afolabi & Laseinde (2019) | Impact of manufacturing sector output on economic growth (1981-2016): Nigeria. | ARDL and Granger causality technique. | There is positive effect of manufacturing capital utilization on real gross domestic product. |
| Jelilor, Enwerem & Isik (2016) | Impact of industrialization on economic growth in Nigeria (2000 – 2013). | Econometric Analysis using Ordinary least Square (OLS) and F. test. | Industrialization has a negative impact on economic growth in Nigeria. |
| Parreen, Khen & Faroeq (2019) | The causal relationship that exist between industrialization, economic growth …. and urbanization (1975 – 2001): Pakistan. | Granger causality test. | No causality between economic growth and industrialization. |
| Effiom & Enang (2014) | Industrialization and economic development in a multicultural milieu: Lessons for Nigeria. | Descriptive analysis | Multicultural milieu provides the credentials and seeds needed to drive industrialization. |
| Iheoma and Jehilor (2017) | The impact of industrialization on economic growth: 10 ECOWASD states. | Panel least sequel technique | Industrialization inhibits economic growth. |
| Kida & Angehar (2016) | Effect of industrialization on economic growth in Nigeria: 1981-2013. | Ordinary least square (OLS) and error correctional method (ECM). | Industrialization was significant and directly contributes to economic growth. |

**Empirical Model**

Annual time series data sourced from central Bark of Nigeria (CBN) statistical bulletin (various years) were used for the analyses. The study covered the period 1970 – 2021. It employed descriptive/trend analysis in one part and econometric analysis in the other part using ordinary least square (OLS) technique in the two models specified.

**Model I**

The functional form is stated as: $Y = f(X_i)$ ……eq 1

Where Y = Gross Domestic Product (GDP) - prox of economic growrh, $X_i$ = explanatory variables drawn from the industrial sector (such as: Manufacturing Output (MOUTPUT), Non-Oil Export (NOILEXP) and Oil Export (OILEXP)).

Equation 1 is thus expanded as:

GDP = F (MOUTPUT, NOILEXP, OILEXP.) …….. 2

To show how important MOUTPUT is in contributing to economic development through economic growth (GDP) equation 2 is transformed econometrically as:

$LOG(GDP)_t = X_0 + X_1 LOG(MOUTPUT)_t + X_2 LOG(NOILEXP)_t + X_3 LOG(OILEXP)_t + U_t$ …….. 3

Where GDP = Gross domestic product
NOILEXP = Non-oil Export
OILEXP = Oil Export
MOUTPUT = Manufacturing Output.
$_0$= the intercept, $X_1 – X_3$ are perimeters to be estimated and
U = Stochastic Error Term.

**Model 2**

The functional form is states as: $Y = f(\beta_i)$ …… 4

Where Y = Per-Capita Income (PCAPINC), $\beta_i$ = explanatory variables drawn from the industrial sector as explained under $X_i$ in Model 1

Equation 4 is expanded thus as:

PCAPINC = f ( MOUNPUT, NOILEXP, OILEXP) …. 5

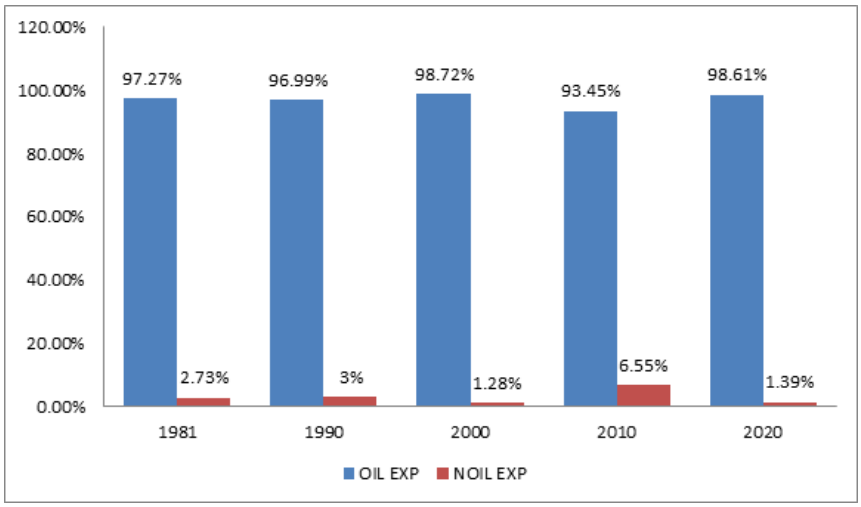
To verify the relationship between PCAPINC and the explanatory variables, equation 5 is econometrically transformed as:

$PCAPINC = \beta_0 + \beta_1 Log\ (MOUTPUT)_t + \beta_2 Log(NOILEXP)_t + \beta_3 Log(OILEXP)_t + U_t$

**Analysis of Data and Interpretation of Result**

This section presents the trend analysis and the econometric analysis.

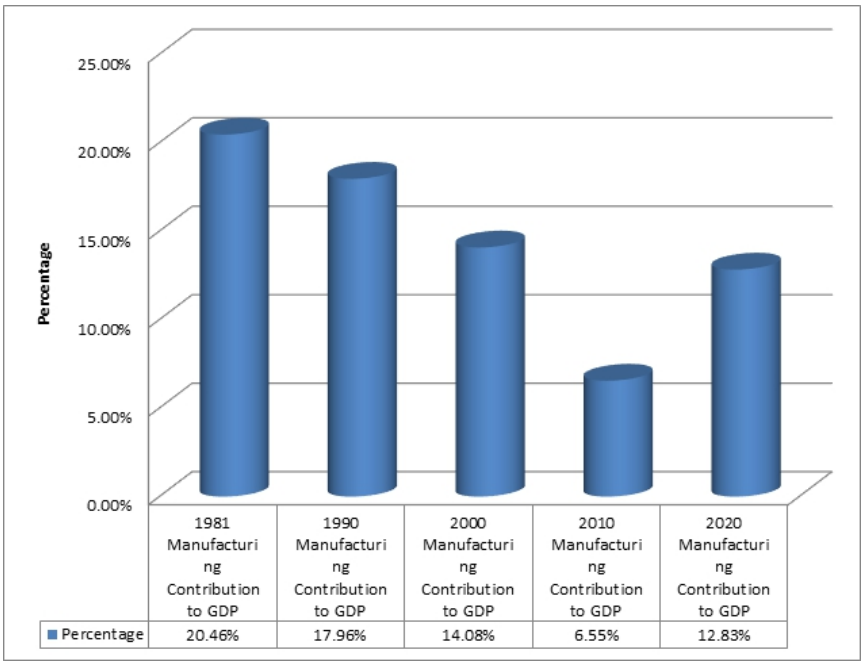
**Figure 1:** Percentage Contribution of Oil and Non-Oil to Total Export




**Source:** CBN Statistical Bulletin and Authors' Computation and Graphing

Figure 1: accounts for the contribution of oil and non-oil to total export between 1981 – 2020. It is clear that on average, the oil sector contributes about 97.0% of total export in Nigeria, while the non-oil sector (manufacturing inclusive) contributes less than 3% on average.

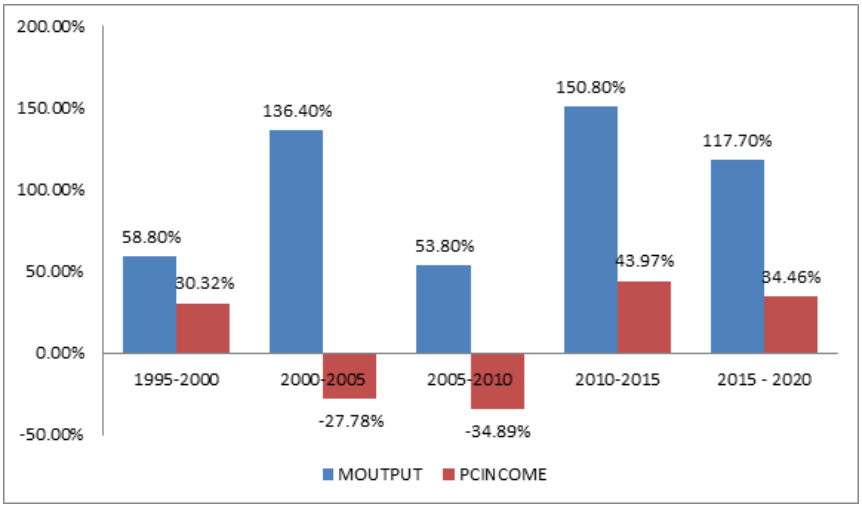
**Figure 2:** Percentage Contribution of Manufacturing to GDP in Nigeria




**Source:** CBN Statistical Bulletin and Authors' Computation and Graphing

The contribution of manufacturing to GDP is clear evidence that the industrial sector through the manufacturing sub-sector is still not equipped to lead the economy into growth and development.

**Figure 3:** Percentage increase/decrease in manufacturing output and per capital income.




**Source**: CBN Statistical Bulletin and Author's Computation and Graphing

From figure 3, the trend of manufacturing output and per-capita income do not skew in the same direction implying that the industrial sector through the manufacturing sub-sector has not contributed enough to sustain the growth of per-capita income which is one of the indices of economic development.

## Econometric Analysis

**Table 1:** Unit root test result

| Variable | Level Form | | First Different | | Order of Integration |
|---|---|---|---|---|---|
| | ADF | 5% Critical Value | ADF | 5% Critical Value | |
| (GDP) | - 3.8587 | - 2.9399 | - | - | 1 (0) |
| (NOUEXP) | -1.1114 | - 2.9399 | - 6.3059 | - 2.9422 | 1(1) |
| OILEXP) | 0.9728 | - 2.9398 | - 4.2096 | - 2.9422 | 1(1) |
| (MOUTPUT) | 1.5239 | - 3.5312 | - 3.7299 | - 2.9422 | 1(1) |
| PCAPINC | - 1.2502 | 2.9399 | - 3.7299 | - 2.9422 | 1(1) |

**Source**: Author's Computation from E-views

It is observed that all the variables are integrates of order one 1(I) except GDP. We therefore run the regression following the order of intergretion.

## Regression Result

The main aim of this study is to investigate how industrialization aid economic growth and

by extension economic development. Mode 1, used manufacturing output which is a major part of industrial output to achieve this.

**Table 2:** Model 1: Dependent variable Log (GDP)

| Variable | Coefficient | Standard error | t-statistic | p. values |
|---|---|---|---|---|
| C | 0.899828 | 0.267847 | 3.359489 | 0.0019 |
| Log (DIF_MOUTPUT) | 0.312723 | 0.059593 | 13.63793 | 0.0000 |
| Log (DIF_NOILEXP) | 0.043793 | 0.041677 | 1.050756 | 0.3006 |
| Log (DIF_OILEXP) | 0.169956 | 0.048735 | 3.487339 | 0.0013 |

$R^2$ Adjusted = 0.776276, Prob (F-statistic) = 0.00000,Durbin -Watson stat. = 1.967870
Source: Authors' computation from E-view package.

From table 4.2, the estimate model is:
Log (GDP) = 0.900 + 0.313 Log (DIF_MOUTPUT) + 0.044 Log (DIF_NOILEXP) + 0.170 Log (DIF_OILEXP).

**Table 3:** Model 2: Dependent variable: PCAPINC.

| Variable | Coefficient | Standard error | T – statistic | P. Value |
|---|---|---|---|---|
| C | 744.7031 | 892.8208 | 0.834101 | 0.4097 |
| Log (DIF_MOUTPUT) | 460.4190 | 253.5334 | 1.816009 | 0.077 |
| Log (DIF_NOILEXP) | 376.173 | 167.6650 | 2.243744 | 0.03111 |
| Log (DIF_OILEXP) | -564.7440 | 195.8274 | -2.883886 | 0.0066 |

$R^2$ Adjusted = 0.457707, Prob (f. Stat) = 0.000014, Durbin Watson Stat = 1.60759
Source: Authors' computation from E-view package.

**Interpretation of Result**
From table 4.2, it is observed that manufacturing output has significant positive effect on GDP (it suggests that I percent increase in MOUTPUT will increase GDP by 31.27 percentage). This supports many of the reviewed works such as, Nwogu & Orji (2019), Ibiloye, Ogunoye & Kleyaban (2022), Attiah (2019) etc.

The coefficient of determination ($R^2$ Adjusted) and the F-statistic were also significant. The Durbin- Wastor static (1.898) suggest that there is no presence of serial autocorrelation in the model. From table 4.3, we observed that MOUTPUT has no significant effect on PCAPINC at 5% level of significant and the variables failed to explain up to 50 percent changes in PCAPINC as depicted by the $R^2$ Adjusted value. The Durbin- watson statistics (1.608) also suggest no presence of serial autocorrelation.

**Discussion of Finding, Conclusion and Recommendation**
The trend analysis of the study showed that the contribution of Non-oil export to total export is minimal between 1981 to 2020 (Figure 1). This confirms that the Nigeria economy still depend on oil for its survival. Also percentage contribution of manufacturing to GDP has been

declining since 1981, (as revealed in figure 2) from 20.46 percent in 1981 to 12.83 percent in 2020. From econometric result, 1 percent increase in MOUTPUT will increase GDP by 31.27 percent but hence its contribution has been declining though not negative, it shows that the manufacturing base if weak and unable to enhance economic growth and development. It was observed that the proceeds of MOUTPUT has no significant effect on PCAPINC, (both econometric and trend analyses confirm this) suggesting weak industrial base. This might be attributed to the fact that proceeds of economic growth has not been really utilized more in the real (or productive) sector of the economy as appropriate to significantly affect people's lives positively. More of it is utilized for excessive salaries and allowances to political leaders and also the little for capital and industrial infrastructure is not properly channeled.

In conclusion, from literature reviewed and analyses conducted, industrialization promote growth and economic growth appropriately utilized leads to economic development, but the Nigeria industrial base is still weak and could not generate enough to support the nation and the little generate is being misused. However, the problem associated with industrial sector development have continued to linger not for want of ideas (policies or programnme) or what to do or how to do it, but rather for want of sincerity or honesty to nurture such ideas to fruition. Given the finding and conclusion above, our recommendation differs little from many authors who holds that the government should create enable environment that will attract investment, or that the government should implement policies that will enhance industrial development. All these facts are known by the government, and it has been making policies to solve them. We therefore recommend that there should be re-orientation of the Nigeria leaders to understand the benefits of public growth against that of individual growth in a nation. And there is the need to change the pattern of leadership and institutions beginning from local, state to federal governments and make them accountable to the people to enhance economic growth and development.

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# Industrialization as Imperative for Sustainable Economic Development in Nigeria

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**Abstract**

The quest for women's participation in politics did not just start today in Nigeria. It has been a long protest from the female gender. In Item Amagu of Ikwo Local Government Area, in Ebonyi State, a case in point emerged in 1987 when Oginyi Echara emerged as the president of the Item Amagu Development Union, women's wing. She made a lot of innovations in an effort to uplift the status of the area. Oginyi's first project was the construction of Item Amagu Tower, used as centre for *Ajiereke* festival. She also stopped women's maltreatment by their husbands where she enacted a law that approved the bundling of such men by a group of women. She was however ousted by a group of men who felt threatened by her reign and that brought about the end of women reign in Item, till 2022 when the same woman was appointed the leader of Item Amagu women group by Chinedu Ogah. This paper therefore argues that women should be given a position to occupy as most of them have genuine innovative minds that can transform the society. The study adopts liberal feminist theory in its analysis. Both primary and secondary sources are used, while qualitative historical method is adopted.

**Keywords:** *Women, Oginyi, Echara, Item, Development*

**Background to the Study**

In Igbo traditional politics, women were not allowed to participate in political activities; this has been the fate of Item Amagu women group since time in memorial. The trend was however truncated in 1987 when Oginyi Echara, a woman of forty-two years in 1987 was elected as president of Item Amagu Development Union (Women wing). She started initiating some policies she believed could help the people to advance in development.

Firstly, she started the construction of Item Amagu tower which was the first tower in Amagu Ikwo community, in January 1987 and completed in April 1987.[1] Oginyi also fought against the maltreatment of women by their husbands and enacted a law that prohibited such act against women. She however, faced a lot of challenges like lack of finance to execute more projects, verbal attacks by the male folks, and finally ousted by Item Amagu men. Item Amagu has never had it well than the regime of Oginyi Echara. It is against this backdrop that this paper argues that leadership should not be restricted to a particular gender (male gender) for among the female gender are ladies with exceptional ingenuity.

**Methodology**

The study adopts qualitative historical method. Also, analytic and descriptive techniques were used to beautify this study. Both primary and secondary sources were used in this study. The primary sources featured oral interviews, while secondary sources include journal articles, books chapters and books.

**Theoretical Framework**

The world view underscores the idea that both genders (male and female) have divine source even though each has a definite role to play in the development of a community. In this regard, one cannot do without the other and any form of inequality is unacceptable. Women have been invaluable in playing the role of a counterpart of man at all levels of the societal and economic order, institutionalization of the institution of daughters (*Umuada*), and stabilization of life within the family in participation in the business of making a home, community, and so on. In the light of the above, why then are women treated as second class citizens, an aberration and a necessary evil?[2]

However, it is in a step to get the above problems solved that feminists and gender scholars propounded theories that could help and solve the problems. The liberal feminist theory supports the importance of equality and seeks individualists' equality of men and women through political and legal reform without altering the structure of the society. This feminist theory posits that the natural differences witnessed among the people should be discarded in order to achieve gender equality.[3] It is in recognition of the above fact the women started developing some political skills to enable them to attend some political functions like their male counterparts.[4] While some societies today in Igboland allow such equal rights of both genders to exist, others abhor it. In *Uju Ede* cult as written by Chiedozie Atuonwu, members were exclusively women, and they enjoyed the same rights and privileges like their male counterparts in *Ekpe* and *Okonko* cults respectively.[5] Nnenna Enwo-Irem, in her paper titled, *Afikpo Women in Traditional Religion, Christianity and Islam*, argues that women play larger role

more than men in agricultural production, which is the mainstay of the peoples economy and they work harder more than the men. They did virtually all the processing of food for home consumption and for sale, as well as making large numbers of pots.[6] The increase role of women in the development of the community, morally, is an initiative to intervene in a war. Emezue noted that women usually guarded the battlefield, usually the neutral zone between two armies waving tender palm fronds (*Omu*). They usually sang songs extolling the virtues of peace and condemning needless violence. Their presence in battlefields normally forced a ceasefire which the situation was exploited by other interested parties usually of men to bring the parties to peace talk. Their sole aim was to create an enabling environment for men to sort out the issues leading to a war.[7] Unfortunately, in Item Amagu, women were not much regarded. Oginyi Echara was denied a plot of communal land generally agreed to be given to her for her impact on the community development. Some people who considered themselves the pillars of the area denied her the gift.[8]

**Early Life History of Oginyi Echara**

Oginyi Echara of Item Amagu Ikwo was born into the royal family of Igboji Obushi, in Ndiagu Amagu Ikwo on 10th October 1945. She lived with the biological parents for only two years and was taken to a family friend of the parent for further upbringing.[9] And this came to be because it was traditionally believed that her personal god [*Chi*] did not approve her upbringing by her biological parents. To solve this problem, their family friend [Imor Nwafor] was invited to take her and raise her up in Item Amagu. Imor Nwafor brought her up and gave her the necessary training except education.[10] Education at that time was meant for the stubborn people or people of questionable characters. It was traditionally believed that school was a place where people's excesses were limited. Obedient ones and ladies were denied the opportunity of being educated. Unfortunately, Oginyi Echara being an obedient child was short changed by this philosophy. Viktor Kalu observed that as late as 1980, the true purpose of colonial education was still suspect among many native communities in Nigeria especially those of them in the hinterland that lacked access to the coastal areas where the whiteman made his initial contact with some communities of the native population…when they were made to see the new reality and to receive it, they not only rejected the offer but also ran away from it.[11]

Kalu further noted that parents only released the urchins and some never-do-well in the communities to school as a way of punishing them.[12] This parental attitude may have been why inept leadership is witnessed in Nigerian society today, because the early educated elites who are the current political leaders of Nigeria were people of questionable characters who never had human sympathy. People who would have transformed the society because of their loyalty were kept at home and wrongly assumed that they were to be exempted from school punishments.

Oginyi Echara married to the first son of Imor Nwafor, Thomas Imor, at the age of 12years. She gave birth to ten children but lost five children to cold hand of death and was left with five children.[13] She had served in different positions of authority. Oginyi Echara was the Chairperson of Okoroko Women Organization from 1991-1998. This was a socio-cultural

organization that houses the whole of Okoroko clan in Amagu Ikwo. She also served as the Chairperson Unwuanyi Ndube Amiara Okum Association from 2000-2008, Chairperson Unwuanyi Ndube Imor Cultural Organization, 2006-2009, Treasurer Unwanyi Ndube Ekoyo Imor Association 1990-1993, Treasurer Unwanyi Nduoduma Association, 2018-present. Treasure Unwuanyi Amagu Association, 2021-present. Chinedu Ogah, a member representing Ikwo/Ezza South Federal Constituency appointed her as the Treasurer Amagu Ikwo Ajiereke Cultural Carnival, 2023. Oginyi Echara is a traditionalist.[14] Oginyi also won several awards among which are Odozi Obodo 1 of Item Amagu, 2021. Ochiora 1 of Okoroko clan, 2006. Ezinne 1 of Unwuanyi Ndube Ekoyo Imor, 2022.[15]

**Achievements of Oginyi Echara.**

On assumption of duty, Oginyi Echara realized the importance of trade and Ajiereke festival, as veritable tools for sustainable development of a particular society, quickly embarked on the construction of a tower, later named Item Amagu Tower. It was first of its kind in Amagu Community of Ikwo local Government Area of Ebonyi State.The quest for people to exchange what they have with what they did not have[16] led to the construction of the tower used for evening trading and the hosting of the Ajiereke festival. Oginyi, being aware of the financial involvement, levied the women of the village. They agreed upon paying the sum of #20 but after set and done, the money realized could not complete the project. She then consulted the village central government under the chairmanship of Bertrand Nwuruku for assistance. This was done and by April, 1987,[17] the tower was ready for use and the people of Item Amagu started trading around the tower. It was constructed at Item Amagu village square. The people trade there in every evening and it later turned to be relaxation and craft production centre.[18]

One finds different goods in every evening especially locally produced goods like rice, cassava, pepper, yam, potatoes, water yam, fish, groundnut, and so on.[19] On the aspect of *Ajiereke* festival, the tower was also used during the festival. Festivals are institutionalized as aspect of the people's culture usually once in a year and they have been present in people's life for ages. They are celebrated to commemorate one important event or another.[20]

*Ajiereke* is one of the major festivals in Ikwo Clan especially in Amagu, Igbudu, Inyimegu, Ekpaomaka, Ameka, Ekpeli, Umota, Echaraukfu, Amangvuru, and Ezeke.[21] It is celebrated in Amagu, Item inclusive when the moon of April of every year is sighted. Men usually clear grasses in a playground called *Edukwuaji* playground in preparation for the *Ajiereke* festival. It is the quest to have a clean and presentable ground that Oginyi Echara built the tower to beautify the environment while dancing a special *Ajiereke* dance called "*Egwu Ereke*".[22]

Another achievement of Oginyi Echara was the ban on the maltreatment of women by their husbands. Before her leadership, women have been suffering from several humiliations from many Item Amagu men, both their rightful husbands and other men. On assumption in office, she swung into action by seeking prohibition of the act. The first person who fell into the trap was Amiara Imor, when he beat his wife for trivial issues of presenting egg sauce with yam to him. He was bundled by group of women in September, 1989.[23]

Furthermore, she introduced cleanup activities in Item Amagu which took place twice in a month. As migrants, women like men; gain an interest in the material and non-material elements of culture, behaviour patterns and ideas that originate on or are more distinctive in the city.[24] Oginyi was able to learn the culture of cleanliness, due to her frequent contact with Enugu state people as a trader. She was greatly influenced by the life in the city and this made her to introduce the clean-up exercise to the remote village of Item Amagu. It is note worthy that other neighbouring villages like Obegu, Enyigbichiri, Orona, Ochienyim were influenced by the leadership style of Oginyi Echara.

Another striking achievement of Oginyi was the formation of cooperative society. This was locally done since most of them were not educated. She was aware that people would make remarkable progress when they came together and helped themselves. According to Simon Ottenberg, they gave loans to members for business, trade and other purposes, where other wealthy people were not willing to help out. They supported members in disputes with outsiders. They also preferred to settle disputes through their unions rather than going to police or native court.[25] Cases like adultery women disobeying their husbands were handled by the cooperative society in addition to money related issues.[26] The above contributions and more earned Oginyi Echara a special place in Item Amagu and beyond. All the titles she earned were all merited because of her dedication to the service of humanity. However, it is not as if all the above achievements were gotten from a platter of gold; she experienced some hitches in the course of her leadership.

**Challenges of Oginyi Echara**

The African culture being patriarchal and hostile to the female gender actually played a heartbreaking role in the life of Oginyi Echara. This traditional culture of not sending female children to school limited most of her views. According to her, when she was ousted from his post, she would have gone to court to seek interpretation, but lack of education humbled her to accept the humiliation from the male counterparts.[27] On this note, lack of Western education was the first challenge she encountered during her regime. Another challenge witnessed by Oginyi was natural hatred by the male counterparts. Anyanwu and Ugbudian noted that there are still deeply ingrained cultural and structural barriers against the mainstreaming of gender on all spheres of human activity. It is pertinent to state that available indicators reveal that girls are discriminated against from the earliest stages of life. The status of girls is still significantly less than that of boys in some countries and this makes girls more vulnerable to discrimination and neglect.[28] This led to her expulsion from the post. Her crime was her women gender who introduced several policies more than men. Another form of hatred shown to her was the type of kindred she came from. In Item Amagu, three kindreds exist. These include: Okoroko, Amaogu and Unwuomara. Other kingdreds believed that Okoroko people were slaves and as a result deserve no position of authority. This scenario dealt with Oginyi as she came from Okoroko.[29] Her gender vis-a-viz her mighty policies and the hatred they had on her kindred led to her expulsion.

Furthermore, there was lack of finance to execute more projects. During her regime, she levied the women to be able to execute and complete the projects she started. The money she realized

was not enough to execute the project and she sought the help of the Item Amagu ruling council, (the male counterparts). Having considered the fact that self-financed development strategy was impossible for the women; the then general chairman of Item Amagu Development Union, Bertrand Nwuruku approved financial assistance which saw the completion of the Item tower.[30] Another striking challenge of Oginyi Echara was disunity among the women. The quest to get favoured in the central government of Item made some women to set Oginyi Echara up.[31] They fabricated stories against her personality and were later championed by the men.

**Conclusion**

In conclusion therefore, the women in Item played enormous role in the contribution of the development of Item Amagu. They served as an eye opener to their male counterparts. Under the leadership of Oginyi Echara, she constructed a tower used for both trading and Ajiereke festival. Other villages learnt the tradition of building a tower in their respective village square from Item Amagu. It is in the light of the above that this paper argues and concludes that the discrimination meted against women both in Item Amagu Ikwo and elsewhere in the world should stop. This is because; they are fellow human beings and also have ingenuity in them which can contribute immensely to the development of the society. Realizing this fact, an Igbo adage comes to play, "*Nwanyi bu Ife"* taken to mean that women also have worth.

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# Organic Fertilizer an Alternative to Chemical (Inorganic) Fertilizer for Sustainable Soil Productivity in the Era of Economic Challenges (A Review)

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**Abstract**

The major constraint limiting crop yield in developing countries globally and especially in the tropical Africa is soil infertility. In order to improve the fertility of the soils for maximum food production and supplies, the use of inorganic (chemical) fertilizers was adopted and used extensively. However, the scarcity and high cost of the inorganic fertilizers in recent times due to economic and global challenges like covid 19 pandemic and wars is worrisome. Also, research has shown that the continuous use of inorganic fertilizer and total dependence on it for agricultural production have led to a decline in soil fertility, land degradation and rottening of certain crops especially tubers, hence the need for an alternative. This review work studies the need of producing organic fertilizers from various organic wastes (such as agricultural waste, sewage sludge, animal waste, municipal solid waste, food waste, etc) as alternative soil amendment using the technology advancement for solid organic waste management as obtained in the developed countries. This when adopted will not only enhance and sustain soil productivity but will help to free the environment of pollution and encourage economic growth. The work also provides insight to the production line of the organic fertilizer, sources or raw materials and advantages of substituting chemical (inorganic) fertilizer with organic fertilizer. It is obvious that organic fertilizer when produced will be affordable, available, cheaper and will improve and sustain the physical, chemical and biological conditions of the soils.

**Keywords:** *Organic fertilizer, Soil, Inorganic fertilizer, Organic waste, Sustainability*.

**Background to the Study**

In tropical Africa, specifically, land degradation is a significant obstacle to agricultural productivity, and the widespread use of chemical fertilizers greatly exacerbates this issue. Due to improper fertilizer usage, which has a negative effect on agricultural soil, it results in a loss of soil fertility. There are existing limits on the use of land for agricultural cultivation due to the necessity for these areas for industrialization and development, which is a difficulty brought on by the rise in food demand due to growing populations. Due to the rising population, land has been continuously farmed year after year, resulting in a deterioration in soil fertility, such that even with the application of chemical/ inorganic fertilizer, little is obtained in return.

Chemical fertilizers and pesticides have been widely used to boost the growth and yield of crops for food production in an effort to provide the essential food supplies. According to Khosro and Yousef (2012), soil infertility is the main factor restricting crop productivity in developing countries around the world, particularly among farmers who lack access to resources. In broad areas of the world that require the fundamentals of sound farming practice, maintaining soil quality can therefore help to mitigate the issues of land degradation, decreased soil fertility, and fast declining output levels. Low crop yield is a widespread issue for most farming systems in Sub-Saharan Africa, according to Mfilinge *et al.* (2014). These low yields are pronounced in legumes and are often associated with declining soil fertility and reduced nitrogen fixation due to biological and environmental factors. Biological nitrogen fixation (BNF), a key source of nitrogen for farmers using little fertilizer, constitutes one of the potential solutions and plays a key role in sustainable production of legumes and even non legumes. It is obvious that tropical soils are deficient in all necessary plant nutrients and large quantities of such nutrients contained in domestic wastes and agricultural by products are wasted.

Conventional agriculture plays an important role in meeting the food needs of a growing human population, which has led to an increasing dependence on the use of chemical fertilizers and pesticides for increased productivity (Bhat *et al*., 2015). Fertilizer application is vital to improve the plant characteristics and uptake of nutrients. However, the rigorous use of chemical fertilizers has led to the deterioration of the dynamic equilibrium of soil, flora and fauna ecosystems as well as water streams contamination. Chemical fertilizers are industrially made substances which are composed of known quantities of nitrogen, phosphorus and potassium. The use of chemical fertilizers causes air and ground water pollution as a result of eutrophication of water bodies (Atiyeh *et al.,* 2001). According to Chun-Li *et al*. (2014), though the practice of using chemical fertilizers and pesticides accelerates soil acidification, it also poses the risk of contaminating ground water and the atmosphere. It also weakens the roots of plants thereby making them to be susceptible to unwanted diseases (Uyovbisere and Elemo, 2000). Intensification of use of mineral fertilizer has been reported to cause soil acidity and environmental health hazard. This situation renders use of inorganic fertilizer in sustainable soil productivity counterproductive (Adepetu *et al*., 1979; Nwite *et al*., 2014).

Consequently, effort must be geared towards finding a close substitute to fertilizer that would ensure slow and steady supply of soil nutrient. Uyovbisere and Elemo (2000) reported superior effect of integrated nutrient management in increasing soil productively. Also, the potential of agricultural wastes to improve soil properties have long been recognized (Johnston,1986; Kit *et al*., 2019). Mbagwu and Ekwealo (1990), noted that combination of wastes ensured well balanced nutrients supply and uptake by crops and led to higher yield. Today, management of organic wastes generated from various sources from the environment is difficult especially in developing countries like ours. These wastes if properly processed into organic fertilizer will free the environment of pollution and sustain soil and agricultural productivity.

**Objective of the Study**

The objective of the review work focuses on the need to produce organic fertilizer from various organic wastes as a substitute to chemical (inorganic) fertilizer due to the high cost, scarcity and degradation of the soil by the inorganic fertilizer. The utilization of biowaste such as animal manure, sewage sludge, municipal solid waste, and food waste for biofertilizer and compost production were examined. Besides that, the advantages and drawbacks of using chemical and organic fertilizers were also examined. This work provides a comprehensive insight on the need of organic fertilizer production from biomass waste as a substitute for sustainable agricultural production.

**Concept and Definition of Organic Fertilizer (Bio-Fertilizer)**

Organic fertilizer or bio-fertilizer is simply a substance which contains living microorganisms which when applied to the soil, a seed or plant surface colonizes the rhizosphere and promotes growth by increasing the supply or availability of nutrients to the host plant (Raja, 2013). A bio-fertilizer is a modernized form of organic fertilizer into which beneficial microorganisms have been incorporated (Raja, 2013). According to Esmailpour *et al*. (2013) bio-fertilizer is most commonly referred to as selected strains of beneficial soil microorganisms cultured in the laboratory and packed in suitable carriers. In a large sense, the term biofertilizer may be used to include all organic resources for plant growth which are rendered in available form for plant absorption through microorganisms or plant associations or interactions (Sarkhel and Barnarjee, 2009).

In order to assure bio-safety, efforts have lately been made to produce nutrient-rich, high-quality fertilizer (organic fertilizer). In order to improve soil fertility and crop productivity in sustainable farming, organic fertilizer has been discovered as a substitute for chemical fertilizer (Itelima et al., 2018). As eco-friendly and affordable inputs for farmers, these prospective biological fertilizers would be crucial to the productivity and sustainability of soil and also safeguard the environment (Sarkhel and Barnarjee, 2009). Organic farming is one of such strategies that not only ensures food safety but also adds to biodiversity of soil Silva *et al*. (2016). The application of organic fertilizer to the soil increases the biodiversity which constitutes all kinds of useful bacteria and fungi including the arbuscular mycorrhiza fungi (AMF) called plant growth promoting rhizobacteria (PGPR) and nitrogen fixers (Abdul-Halim, 2009). There are so many microorganisms thriving in the soil, especially in the

rhizosphere of plant. A considerable number of these microorganisms possess a functional relationship and constitute a holistic system with plants. They have beneficial effects on plant growth (Munnoli *et al.*, 2010). Application of beneficial microorganisms in agricultural practices started about 60 years ago and it is now evident that these beneficial microbes can also enhance plant resistance to adverse environmental stresses e. g., water and nutrient deficiency and heavy metal contamination.

Through nitrogen fixation, phosphate and potassium solubilization or mineralization, release of substances that control plant growth, production of antibiotics, and biodegradation of organic matter in the soil, biofertilizers maintain a soil environment rich in all types of macro and micro nutrients (Javaid, 2011). When used as soil or seed inoculants, biofertilizers multiply, take part in nutrient cycling, and increase crop productivity. Typically, 60% to 90% of the total fertilizer applied is wasted, and the remaining 10% to 40% is absorbed by plants. Therefore, biofertilizers can be a crucial part of integrated nutrient management systems for sustainable agricultural productivity and a healthy environment (Chemura, 2014). Biofertilizers are products containing living cells of different of micro-organisms which have ability to convert nutritionally important elements from unavailable to available form through biological processes (Munnoli *et al.,* 2010; Ritika and Uptal 2014).

**Literature Review**

This review is intended to x-ray the role of biofertilizers in sustainable agriculture thereby meeting the needs of agriculturists and plant biologists whose work focuses on creating clean and efficient means of to improving soil quality by nourishing and maintaining the useful and natural flora of microorganisms. Furthermore, it presents recent developments in the field of agricultural management that reveals the potentials of the application of biofertilizers in terms of increased nutrient profiles, plant growth and productivity and an improved tolerance to environmental stress.

The need for sustainable fertilization with minimal environmental impact has given rise to the search for alternative fertilizer sources for use in agriculture (Sarkhel and Barnarjee, 2009). So, sustainable organic farming practices can reverse the declining trends in the global productivity due to land degradation. The management of organic waste presents a challenge for developing countries as the generation of waste is increasing at a rapid and alarming rate (Adeoye *et al.*, 2005; Obi *et al.,* 2016). According to one definition of organic fertilizers, these are substances with a known chemical composition and high analytical values that provide plant nutrients in a form the plants can use (Gupta, 2004). The term "organic fertilizers" refers to fertilizers made from plant, human, or animal remains (such as compost or manure). Natural ingredients are used to make organic fertilizers, which is typically related to our biodegradable wet suit. Compost is often created through the breakdown of biodegradable garbage, paper, leaves, fruit peelings from leftover meals, and even fruit juices are among these wastes. The soil benefits from the use of organic fertilizers (Sisay and Sisay, 2019). It improves the soil's ability to support plants. Organic waste management is a global problem due to large scale urbanization, economic growth, and population explosion but can be solved by converting the waste into organic fertilizer. Environmentally, unhealthy disposal of organic

wastes can degrade the environment and may cause diseases. Land filling, open dumping, and burning disposal practices are ecologically unsustainable, due to the production of certain toxic gases and leaching which can cause environmental pollution (Dube *et al.*, 2014). The management of organic waste is a serious issue for the maintenance of pollution free environment. Much awareness towards the sustainability and technological advances for organic waste management has been implemented to reduce the generation of unnecessary waste (Kit *et al.*,2019). The recycling of this waste is being applied to produce valuable organic matter, which can be used as fertilizers or amendments to improve the soil structure. The addition of nitrogen fixation will enhance crop growth and avoid land degradation after long periods of agricultural activities. Phosphorus is crucial for energy metabolism, storage, and expression of genetic information (Chalmin and Gaillochet, 2009). On the other hand, potassium is essential for stimulating photosynthetic systems in plants and can improve plant growth, yield, and resistance to drought, thereby helping plants to maintain growth under stressed conditions (Pappu *et al.*, 2007) This has generated increasing interest in renewable feedstock from biomass waste since the past decade.

Microbial conversion of vegetable waste to biofertilizer is a feasible and potential technology in the future to maintain the natural resources and to reduce the impact on environmental quality. It is a simple biotechnological process of composting, in which certain species of bacteria are used to enhance the process of waste conversion and produce a better end product. There are several naturally occurring micro organisms that are able to convert organic waste into valuable resources such as plant macro and micro nutrients, and reduce the C:N ratio to support soil productivity. These micro organisms are also important to maintain nutrient flows from one system to another and to minimize ecological imbalance (Silva *et al.*, 2016).

Many fruits and vegetables present nearly ideal conditions for the survival and growth of many types of micro organisms. The internal tissues are nutrient rich and have a pH nearly neutral because the principal storage polymer is starch. During the composting process, various parameters including C:N ratio, composting temperature, pH of the finished product, moisture content and the presence of potential pathogens such as coliform bacteria are used to assess the quality and stability of the compost (Wu and Ma 2002; Abu- Qdais and Al-Widyan, 2016). Presently, a simple microbiological process, could provide a solution to the problem of kitchen waste disposal, and for recycling of solid waste into useful manure by the action of decomposing bacteria. Much of these biomass or organic wastes are disposed in landfills or incinerated due to the lack of space. The biomass wastes contain valuable nutrients, which can be put to good use if managed properly. They contain high organic matter and can be treated to remove pathogens and then used to fertilize soils. Unlike chemical fertilizers, organic matter requires a period of time lag to mineralize. This mineralization time will depend on the composition of the organic matter, characteristics of soil, moisture, and temperature conditions (Ostos *et al.*, 2008; Westerman and Bicudo, 2005). The soil properties will also affect the chemical reactions in the soil and can alter the dynamics of the plant nutrients intake. Besides that, the feasibility of these organic fertilizers is largely dependent on the conversion processing costs, production costs, quality of the organic fertilizers,

environmental assessments, and safety to human and animal health. The use of biofertilizers will also lead to the socioeconomic and ecological improvements, especially in soil quality amendments, which will contribute tremendously to the human health and safety, food quality, and environmental preservation (Bhat *et al.*, 2015).

In order to boost food production and soil fertility while reducing environmental damage, the application of these organic fertilizers and soil amendments is very promising (Atiyeh et al., 2001). By replacing mineral fertilizers with organic fertilizer, it would be possible to increase crop yields while reducing the consequences of groundwater contamination (Chemura, 2014). Furthermore, using biofertilizers can help with the bioremediation of soils that have been contaminated with hydrocarbons and pesticides. Reducing the use of high levels of chemical fertilizers, which would have a severe impact on human health and the environment, is thus a recent problem in agriculture research sectors (Silva *et al.*, 2016). With the preservation of the environment and waste reduction in mind, integrated nutrient management strategies such as the combination of chemical and organic fertilizers are being developed to enhance the sustainability of crop production (Adetunji, 2005; Chen, 2006).

**Source or Raw Materials for Organic Fertilizer Production**

**Agricultural wastes:** Generally, agricultural wastes have been considered as the major source of organic fertilizer. The by-products of agricultural activities are usually referred to as "agricultural waste" because they are not the primary products. Agricultural waste or biowaste include waste such as animal manure, sewage sludge, municipal solid waste, food waste, plant and crop residues (Sartaj *et al.,* 2018). The impact of agricultural waste on the environment depends not only on the amounts generated but also on the disposal methods used. Some of the disposal practices pollute the environment. For example, agricultural waste burning is a common practice in the undeveloped countries, but it is a source of atmospheric pollution. Burning agricultural waste results in the release of pollutants such nitrous oxide, carbon (ii) oxide, and smoke carbon (Ezcurra *et al.*, 2001). Ozone and nitric acid are produced together with these pollutants, which contribute to acid deposition (Lacaux *et al.*, 1992) and pose a major threat to both human and ecological health. Animal waste pollution (including feces, urine, respiration and fermentation gases) is a global issue that is most acute and serious in nations with dense populations of animals and little available land for manure disposal. Animals excrete wastes in solid, liquid, and gaseous forms, and they quickly release respiration and fermentation gases into the environment (Sabiiti, 2011). After excretion, solid and liquid animal waste is subjected to microbial biomass and soluble and gaseous products. Some of these products have an impact on the environment, as well as water quality, soil deterioration and air pollution. Odour pollution among urban livestock farmers was reported to contribute highly to social tensions in kampala, Uganda ( Sabiiti,2011).

The raw materials or sources of organic fertilizer or bio-fertilizer were further subdivided as follows:

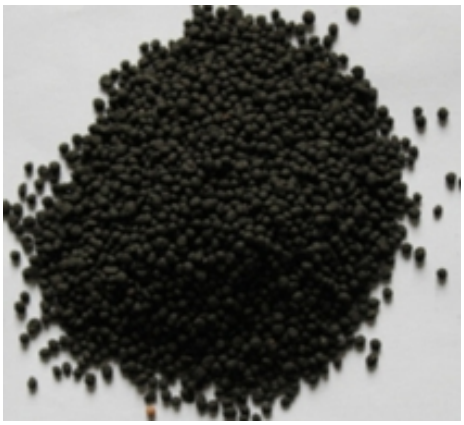
1. Agricultural waste: straw, rice bran, etc
2. Animal waste: chicken manure, pig, cattle and sheep manure, etc.
3. Industrial waste: vinasse, sugar residue, etc.

4. Household waste: kitchen waste, vegetable market and slaughterhouse waste, etc.
5. Municipal sludge: river silt, sewage sludge, etc. (Sartaj *et al.,* 2018).

Moreso, the application of excessive animal wastes on land as fertilizers and soil amendment is subject to surface; run-off and leaching that may contaminate ground or surface water. The aim should be to make agricultural wastes a resource that can be utilized for agricultural production. Agricultural wastes can be used to enhance food security mainly through their use as bio-fertilizer and soil amendment use as animal feed and energy production. They contain large amounts of organic matter, and many of them can be directly added to the soil without any risk. Turning these agricultural wastes (crop residue and animal manures) into organic fertilizers (through composition) is one of the waste treatment technologies that make it possible to use organic waste as a fertilizer even in populated areas (Sabiiti, 2011). Technology plays a key role in soil fertility improvement, and hence crop productivity (Javaid, 2011).

**Organic Fertilizer Production Line:** The organic fertilizer production line is commonly used to process different fermented organic substance into organic fertilizer or bio- fertilizer. It adopts one-step molding technology. Animal manure and agricultural waste are recycled as the main raw materials; thus, manure or dung waste is not only creating economic benefits for the enterprise, but also making a great contribution to environmental projects for mankind. After safety disposal and fermentation, these materials are made into organic fertilizer. Thus, organic fertilizer containing a variety of organic acids, peptides, and rich nutrients including nitrogen, phosphorus and potassium. Not only provide comprehensive nutrition for crops, also with long fertilizer effect, which can increase and update the soil organic matter and promote microbial breeding, improve soil physical and chemical properties and biological activity.

**Figure 1:** A sample of produced organic fertilizer



**Source**: fertilizer-machines.com (www.fertilizer-machines.com)

**The Working Process of organic fertilizer or Bio-Fertilizer Production Line.** Organic fertilizer production line is a complete set of equipment from raw materials collection to the organic fertilizer packing. The line of production is as follows:

1) Organic Materials Fermentation Process: Which plays the preliminary but indispensable role in the whole production line. Two main types of compost turner are widely used to turn and mix the compost and accelerate the fermentation speed, Self-propelled compost turner and hydraulic compost turner.
2) Crushing Process: The compost lump materials should be grinded before the granulating process. But we can leave out crushing process when the compost material is fine enough. Vertical chain crusher and double-shaft horizontal crusher, two types of crushing machine can be used to crush lump compost fertilizer raw materials.
3) Mixing Process: two types of mixing machine are applied to mix raw materials in the fertilizer production line: horizontal mixer and vertical mixer.
4) Granulator Process: Granulating process is the core part in this production line, so we choose the suitable model of fertilizer granulator according to customers detailed requirements. Disc granulator machine can be chosen to granulate the materials evenly.
5) Drying Process: When granulating, the moisture of fertilizer raw materials should be less than 25%, so we should dry the raw materials if the moisture is more than 25%. Rotary drum drying machine is mainly used for drying the fertilizer with a certain degree of humidity and particle size.
6) Rotary Drum Cooling Machine: Which is used for cooling fertilizer to make fertilizer particles stronger.
7) Rotary Drum Screening Machine: which is used to separate the granules from the large particles which need to be returned for the second crushing and granulating. Rotary drum coating machine is used to coat the fertilizer and prevent the fertilizer from sticking together. 8) The last process is packaging process: Fertilizer packaging machine can package bags quantitatively and automatically. We also need some auxiliary equipment for connection such as belt conveyor, bucket elevator, etc. (Mahimaraja *et al.*, 2008).

**Features of Organic Fertilizer Reproduction Line**

1. The line takes animal manure and agricultural waste as its main material, not only turns the waste into treasure, but also protects the environment.
2. The whole fertilizer production process is centralized controlled, so this series of fertilizer machines are highly automatic and easy to operate.
3. Both batching system and packing system are controlled by the computer, thus ensuring the precision of material batching and fertilizer packing.
4. High-quality, stable performance, compact process layout, advanced technology, and convenient maintenance." (Itelima, J.U., Bang, W.J., Onyimba, I.A , 2018; Sabiiti, 2011).

**Advantages of Organic Fertilizers**

The use of organic fertilizers is particularly important in most parts of Africa, where low availability of nutrients is a serious constraint for food production (Brouwer & Powell, 2008). Composting and production of organic fertilizer from the organic wastes also reduces the volume of the waste, hence solving major environmental problems concerning disposal of large quantities waste, kills pathogens that may be present, decrease the germination of weeds in agricultural fields and reduces odour (Jakobsen, 1995). Organic fertilizer had the advantage of nutrient relationships that were more gradual than those in chemical fertilizers. This more gradual procedure prevents overfertilization, which could harm the plant (Sisay & Sisay, 2019), and enables the plant to utilize the fertilizer in a more natural manner. Additionally, the soil can be given a better airflow and drainage system. Organic fertilizers do not leak and reduce soil acidity, in contrast to chemical fertilizers. The good microbes in the soil are not wiped out by them. Aside from increasing nutrient availability, organic fertilizers also enhance the soil's structure, including air circulation that supports beneficial bacteria (Sisay & Sisay, 2019).

By utilizing more biodiversity, organic fertilizers improve soil structure and water infiltration. Organic farming is able to sequester carbon in the soil, which helps to reduce the greenhouse effect and global warming. Numerous management techniques employed in organic farming boost soil carbon uptake, boosting productivity and favoring carbon storage. For agricultural production, combinations of plants and animals optimize the cycling of nutrients and energy (Sisay and Sisay, 2019). The compost can be sold for additional revenue or used on the same farm, both crop residues and animal waste can be used as animal feed. However, the nutrient content of animal waste depends on the animal species, type of feed, and bedding material used (Mackie, 1998). The rumen contains the microbial enzyme cellulose, which is the only enzyme to digest the most abundant plant product, cellulose (Sabiiti, 2011) with ruminants, nutrients in by-products are utilized and do not become waste disposal problem (Oltjen and Beckett, 1996; Swathi, 2010). According to (Mackie *et al.,* 1998), besides generating revenue from the energy produced, waste-to energy schemes offer an alternative and environmentally acceptable means of waste disposal. Additionally, the schemes also provide a valuable by-product, a good quality, agricultural fertilizer that is nearly odourless. It is also believed that organic fertilizer if produced will be affordable, available and cheaper since the raw materials could be sourced within and not elsewhere like that of inorganic fertilizers. With the establishment of organic fertilizer plant, enough quantity will be produced and sold to the public thereby making income.

Recently in Nigeria, research interest has been diverted to use of organic wastes as source of nutrients (Uyovbisere and Elemo, 2000). This is as a result of scarcity and high cost of inorganic fertilizer. Intensification of use of mineral fertilizer has been reported to cause soil acidity and environmental health hazard. This situation renders use of inorganic fertilizer in sustainable soil productivity counterproductive (Nwite *et al.*, 2014).

**Conclusion and Recommendations**

The obvious decrease in soil productivity, increase in soil acidity and environmental health

hazards caused by the continuous use of inorganic fertilizer as well as its scarcity and high cost have led to the demand for alternative. The growing population of the world and the need to attain food security demand more sustainable agricultural practices. To this end, organic fertilizer produced from different biowastes has been considered as an alternative due to its ability to sustain soil productivity and crop production. There is need to commercialize organic fertilizer production in tropical African using the available technology as obtainable in the developed countries. The raw materials for organic fertilizer (biofertilizer) are obtained from different biowastes and can be sourced with little or no cost with a reliable supply as these wastes are daily generated. It is believed that greater advantages will be recorded with the conversion and transformation of the organic wastes into organic fertilizers since the fertilizer produced will be readily available, affordable, cheaper, source of income and will sustain soil and crop productivity unlike the inorganic fertilizer.

It is therefore, recommended that the government at all levels should embrace the production of organic fertilizer by installing organic fertilizer plants in different agricultural zones. It is also necessary that the fertilizer when produced should be subsidized for proper utilization of every farmer.

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# Broadcast Media Intervention in Agriculture: Study of Gabasawa Local Government Area of Kano State

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**Abstract**

The study examines broadcast media intervention in agriculture study of Gabasawa Local Government, Kano state. Mass media plays vital role in agricultural process. The media can enhance knowledge and change people behavior by attracting their attention to specific issues. The study is within development media theory, survey research method was adopted. Findings revealed that media play significant role in agriculture. Most of the programmes in broadcast media are educative and beneficial to farmers such as (Noma Tushen Arziki) and (Mukomagona) as indicated by majority of respondent. The study discovered that in adequate fund, lack of fertilizer and erosion are their major problems. Based on the above findings the study recommend that adequate fund should be given to rural farmers inform of government assistance, agricultural programmes on broadcast media should be given priority to crop cultivation and animal husbandry with proper knowledge on modern techniques.

**Keywords:** *Mass media, Agriculture, Development communication*.

**Background to the Study**

Agriculture is the key practice of cultivating plants and livestock. It is the key for development process especially in developing Countries (Ogen, 2007). Agriculture contributes to economic growth and creates surplus labor for firms in manufacturing sectors. It also creates capital for manufacturing investment and provides food for domestic consumption. It also enhances foreign exchange for financing importation of intermediate and capital goods. Without agricultural development industrialization and industrial growth will experience severe economic imbalance. Due to the importance of agriculture in Nigeria the Federal government in 2010 came up with agricultural transformation Agenda (ATA) the policy was implemented in 2011: The policy aims at boosting agriculture foreign exchange earnings and tackles the problems of risen food importation in Nigeria (Federal ministry of Agriculture and development, 2016).

Nigeria also has embarked on several agricultural development plans and programmes, production have not kept pace with the growing population some of the agricultural programmes embarked on the Countries include Operation Feed the Nation OFN (1986) River Basin Development Authorities NALDA in 1992, National Fadama Development Project NFDP in 1992 and National Agricultural Development Fund NADF in 2002. Mass Media help farmers to have clear knowledge about the role of managing their crops and livestock (Hassan et al, Shafril, Samah, Asnarulkhad, and Ramli, 2009). The Media can enhance knowledge and change people behavior by attracting their attention to specific issues. It helps to communicate different method and skills to farmers.

**Statement of the Problem**

Agriculture contributes immensely to improving population than any other sector. Despite the immense contribution the sector is still lacking serious development, because majority of agriculturist especially in the rural areas are still using primitive implementation and traditional methods of cultivation. It is believed that there is general reluctance by the small-scale farmers especially in the rural areas to adopt new ideas. Other problems that militate against the development of Agriculture in the rural areas include proper information, in adequate fund, education, high cost of modern Agriculture implements, and in adequate supply of fertilizer to rural areas. Considering the above problem there is needed to study on the area.

**Objectives of the study**

1. To understand the problem facing Agriculture in Gabasawa local government.
2. To understand the importance of Mass Media in agricultural development in Gabasawa local government.
3. To find selected programmes that Mass Media cover in Agriculture.

**Research Questions**

1. What are the problem facing Agriculture, Gabasawa local governments?
2. What are the importance of Mass Media in agricultural development in Gabasawa local government?

3. What are the selected programmes that Mass Media cover in Agriculture?

**Literature review**

Television broadcast Agriculture information among farmers and provides them with important knowledge through dialogue especially with agricultural development experts (oso, 1993).

In India television programmes has played a gigantic role in boosting agriculture activities it was discovered that by watching farming related Agenda on television, Agricultural growers can easily obtain better knowledge (Murty and Abhinor, 2012) hence information is needed especially to growers in order to get new information on Agricultural development (Buren, 2000) Mass Media allow many stakeholders to share the best information on many issues and farmers have gained much better information from the latest technology and gained useful information about Agriculture. Mass Media disseminate new methods and various new programs were announced on television to raise awareness among farmers especially in semi urban areas (Age, 2012).

Important information related to Agriculture can be provided using radio.

Nakabugu (2010 p. 202) said;

> *"Information on better farming methods, Improved seeds, timely planting, agro-forestry, better harvesting methods, soil conservation, Marketing, post-harvest handling and diversification."*

He states that rural radio gives farmers an opportunity to interact with one another and other relevant authorities. extension workers, crop and animal experts through formats like phone call in programmes and on the location broadcast. He also said radio mobilizes farmers' practices from the beginning to the tail end.

Chapman, R. etal (2003 p. 203) remarked about radio;

> *"Radio can be used to improve the sharing of agricultural Information by remote rural farming communities, participatory Communication techniques can support agricultural Extension efforts especially using local languages and rural radio to communicate directly with farmers and listener groups."*

He emphasized that radio asa tool of agricultural development and rural development should aimed at bringing transformation in livelihood of the farmers by providing useful information.

Shawna (2001 p.20) states that

> *"Agricultural radio and TV programme is seen More in the areas of vegetable cultivation, plant Protection, pesticides, cereal crops, livestock and Poultry, store management of the cereal crops etc."*

He stated that agricultural programmes transmitted by radio Nepal have been very much useful in the context of Nepal. Such programmes have left positive impacts in both small- and large-scale development. Shortage of food and malnutrition is a global crisis. Valentine cited

in hunger and malnutrition grow every day throughout the world partly due to the crisis in peasant and indigenous agriculture. This has worsened sustainable food system and people are losing sovereign control over their resources.

According to United Nations (2008) the current global food crisis has emerged from recent unprecedented increase in the price of food, especially of staples, coupled with the shortages and diminishing food stocks, which have reduced access to food for many people (particularly the poor) In a large number of developing countries. There has also been a substantial increase in the food import bills of developing countries (UN 2008).

**Theoretical Framework**

The study anchored on development Media theory, the theory is within the field of international development which aimed at improving the conditions and quality of life of people especially in developing countries it includes dissemination and education, behavior change, social marketing, social mobilization, media advocacy, communication for social change and participatory communication. The theory is indeed for the betterment of the society which Agriculture is part of it.

**Methodology**

Survey research method was adopted survey is form of quantitative research that involves asking large number of people question about their behaviour, attitudes, beliefs, knowledge, personality, characteristics and other personal details (Berliner 1986). Questionnaire was employed which contains combination of open and close ended questions in two sections. Section Afocuses on investigating the subject matter of enquiry while section B focuses on the demographic characteristics of the response. Two hundred and twenty-five copies of questionnaire were randomly distributed.

Gabasawa local government area was purposively selected according to National Population commission (2006), Gabasawa Local Government has its headquarters in the town of Zakirai it has an area of 605km2 and population of 211,055 population (2006 census) probability sampling was used, because of the quantitative nature of the research. Simple random sampling is a procedure of giving every subject in a given population an equal chance of appearing in a selection in which the samples item or subjects are chosen randomly. There are eleven wards in Gabasawa local government these include Gabasawa, Garun danga, Joda, Karmaki, Mikiya,Tarauni, Yantar Arewa, Yantar kudu, Yumbu, Zakirai, and Zugachi. 20 questionnaires were distributed to the wards making the total of 220 but only 200 questionnaires were retrieved.

**Table 1:** Problems facing agriculture in Gabasawa local government.

| Variables | Frequency | Percentage |
|---|---|---|
| Inadequate fund | 102 | 51% |
| Lack of fertilizer | 89 | 44.5% |
| Erosion | 9 | 4.5% |
| Total: | 200 | 100% |

**Table 2:** The selected programmes by farmers

| Variables | Frequency | Percentage |
|---|---|---|
| Noma Tushen Arziki | 108 | 54% |
| Dom Noma | 58 | 29% |
| A Koma Gona | 34 | 17% |
| Total: | 200 | 100% |

**Table 3:** Mass Media Message on Agriculture

| Variables | Frequency | Percentage |
|---|---|---|
| Good | 166 | 83% |
| Fairly good | 20 | 10% |
| Bad | 14 | 7% |
| Total: | 200 | 100% |

**Table 4:** Benefit drive by agricultural programme through mass media

| Variables | Frequency | Percentage |
|---|---|---|
| Very Beneficial | 146 | 73% |
| Beneficial | 36 | 18% |
| Not Beneficial | 18 | 9% |
| Total: | 200 | 100% |

## Findings

To analyse the above collected data, the first table is about the problems facing agriculture in Gabasawa local government the respondents gave their response as in adequate fund, lack of fertilizer and erosion are their major problems. Those with inadequate fund are 102 respondents, (51%) those who said lack of fertilizer are 89 representing (44.5%) and those who said erosion are 9 representing (4.5%).

The second table are the selected programmes by farmers in gabasawa local government area of Kano state. Noma Tushen Arziki has 108 respondents representing 5490, Don Manoma has 58 respondents representing 29% and A komagona has 34 respondents representing 17%. Table three stated the relevance of Mass Media messages on Agriculture respondents who said the programmes promote their agricultural activities are 160 representing 83% while fairly good has 20 respondents representing 1010 only 14 respondents representing 7% said it is bad. Table fair is about the benefit drived by Agriculture. Majority of respondents representing 73% benefited with the programmes, only 9% are not benefited with the message.

## Conclusion

Mass Media play significant role in Agriculture especially in Gabasawa local government. Most of the programmes are educative and beneficial to farmers as indicated by majority of

the respondents. The study shows the problems of farming in Gabasawa local government and the agricultural programmes mostly preferred by the rural farmers.

**Recommendation**

The study observed that most problem facing agriculture in rural areas are associated with inadequate fund, the study therefore recommends adequate fund should give to rural farmers in form of government assistance, the study also recommends that Agricultural programmes on Broadcast Media should be given priority to crop cultivation and animal husbandry with proper knowledge on modern techniques.

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# Effects of Debt Service on Infrastructural Development in Nigeria

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**Abstract**

The study examines the effect of debt services on infrastructural development in Nigeria. The increase in debt services has been worrisome; recently Nigeria's debt service has astronomically increased without interruption. This uninterrupted increase of debt service has resulted to decrease in infrastructure, consequently, decreasing private investment and aggregate demand, thus, increasing unemployment in the country. The study employed an econometric model to test a long run relationship between debt services and infrastructural development and found a long run relationship. The study also found a negative and statistically significant relationship between debt services and infrastructure in Nigeria. Base on the findings, the study recommended that government should look for alternative means of raising fund rather than borrowing.

**Keywords:** *Debt Service, Infrastructure, Development and Effects*

**Background to the Study**

The habit of borrowing is inevitably becoming a standard in Nigeria fiscal system without any restriction, mounting unwarranted pressure on the limited revenue driven by higher level of debt servicing. Developing nations are usually confronted with limited fund to finance major infrastructural project in their domain, they mitigate this by borrowing fund either external or internal (Aladejana, Okeowo, Oluwalana & Alabi, 2021). Borrowing results to debt and debt attracts cost to service it, which technically serve as an obstacle to infrastructural development. According to Aladejana et al, (2021) "Infrastructural development consist of the provision, construction, improvement and rehabilitation of capital and productive projects like roads, airports, hospitals, education and research institutes, power development, human resources development etc in consonance with international standards.

Abdulkarim and Saidatulakmal (2021), argued that the cost of servicing massive public debts could swallow up a substantial part of government limited revenue which serves as a barrier in achieving growth and development of countries. Reputable institutions such as the international monetary fund (IMF) have warned Nigerian government on the implication of her unquenched desire for debt borrowing, Ari Aisen, the resident representative of IMF for Nigerian, representing the Sub- Sahara African regional economic outlook on 30th May, 2022 in Abuja warned that if adequate measures are not taking to improve revenue generation in Nigeria, debt servicing may gulp government's revenue up to 100 percent by 2026 (Punch Newspaper 31st May, 2022). Also, the President of African development bank (AFDB) Akinwumi Adesina expressed displeasure over the rising debt service ratio to revenue in Nigeria which is as high as 73% as cited in Amadi, Agya, Eli and Yunisa (2022).

In the same token, the Nigerian minister of finance, while presenting breakdown of the highlight of the 2023 appropriation Act, revealed that between January and November 2022, the Nigerian's federal government spent about N5.24 trillion on debt servicing compared to the capital expenditure of NI.88 trillion gulping thrice its infrastructure spending within the period under review (Business Day 4th Jan, 2023). The harmful part of debt servicing in Nigeria is the sustainability problem that has now confronted the current administration, where almost 100 percent of her revenue is now used to service her debt. Nigeria's debt service to revenue ratio is reported as 80.7% according to the information contained in the 2023 budget appropriation Act (Business Day 4th Jan, 2023). The ratio currently has been on the rise as a result of dwindling government revenue accompanied by increase government expenditure. Between 2016 and 2022, the Nigerian government has faced revenue deficit due to falling oil price and uncontrolled oil theft in the Niger Delta region (Amadi, et al, 2022). For instance, in 2021, the government aimed at generating revenue of N8.1trillion but was unable and generated only N6.2 trillion leaving revenue deficit of about N2.0 trillion. Government is therefore forced to look elsewhere to raise revenue in other to meet her obligations which attracts some interest and undue burden to future generations.

Debt service is the cost incurred in other to upset or settle the repayment of interest and principal on a debt for a particular year. For the past years, debt services have astronomically increased without interruption. This uninterrupted increase of debt service has resulted to

decrease in infrastructural development, consequently, decreasing aggregate demand and private investment, thus, increasing unemployment in the country. In 2020 the Nigerian government used about N1.85 trillion to service her debt and in 2022 about N5.2 trillion was used indicating about 188.8 percent increase between 2020 and 2022. According to Coccia (2017), the chunk of resources that would have been used or available to invest in capital infrastructure that sustain growth and development will be channel to service huge public debt. This act if not mitigated or checked will perpetually frustrate the development of infrastructure in the country. Infrastructure is very important and has been a top priority in the developmental process of any economy mostly the developing nations. Improved infrastructure is synonymous with poverty reduction, the need for infrastructural development is very fundamental for economic growth but the challenges facing this infrastructural development is lack of fund which propel government to dive into borrowing either internally or externally in other to fund infrastructural deficit. Experience has shown that most of the borrowed funds were channeled into personal pockets depriving the nation to meet its infrastructural need (Amadi, Adi & paabu, 2020). Infrastructure contributes to economic development by increasing productivity as well as employment which enhance quality of life (Onwuka, 2022).

The origin of Nigeria's external debts dates back to 1958 when a sum of US $28 million was contracted for railway construction (Amadi, et al, 2022). Between 1958 and 1977, the level of foreign debt was minimal, as debt contracted during the period were the confessionals debts from bilateral and multilateral sources with longer repayment periods and lower interest rates (Adesola, 2009). It is worth mentioning that both present and past governments in Nigeria have spent enormous amount of fund to service both internal debt and external debt taken (Alfredo and Franciso, 2005).

Amadi, et al, (2020) observed that "misappropriation or misallocations of borrowed fund to projects incapable of creating wealth are factors responsible for increase in debt service ratio to revenue in Nigeria. Corruption in the system cannot be ruled out where politician directs the borrowed fund to their private pocket or site projects based on tribal consideration instead of merit. Compounding the problem is where debt incurred were channels to social investment in expense of capital investment that is capable of raising the level of aggregate demand which bring additional income and employment in the economy. This study is intended to empirically examine the effect of debt service on infrastructural development in Nigeria. The study tests the hypothesis that: There is no significant relationship between infrastructural development and debt service in Nigeria.

## Literature Review

The study anchored its theoritical review from the dual gap model developed by Chenery and Strout in 1996. Primarily, the model states that investment is a functions of savings, and domestic savings are insufficient to guarantee domestic investment that will enhance economic growth and development. They argueed that most developing countries face lack of domestic savings to fund the needed investment. It was pointed that to meet the domestic savings deficit, foreign aid or foreign investment was neccessary to help developing countries

to achieve the desired rate of economic development (infrastructural development). The dual model shows the need for financial resources from external sources to complement available limited domestic financial resources especially in developing countries.

The study by Onwuka (2022), examines the effect of external debt burden on infrastructure development using the ARDL approach to analyze the work. Findings reveal that external debt, domestic debt and inflation rate have negative impact on infrastructural development in the long run, while exchange rate has positive effect on infrastructure in the long run. And recommend that government should cut down excessive borrowing and that existing one should be invested in projects that would eventually generates enough returns to defray such debt.

For Awa and Alo (2022) while using multiple regressions anchored on ordinary least square (OLS) techniques to determine the impact of public debt on infrastructural development in Nigeria. Findings revealed that debt servicing cost has negative significant effect on federal capital expenditure (infrastructure), but trade debt has no significant effect on federal government capital expenditure and recommended that external debt should be used for the purpose for which it was borrowed for and such debts should be used on basic infrastructure that will help to improve on business environment and economic output that will ease repayment. More specifically, the empirical analysis by Ogunjimi (2019), using ordinary least square (OLS) techniques in studying the impact of public debt on investment in Nigeria. The outcome of the result revealed a negative significant impact of public debt on investment in Nigeria. Also, Saungwene, Odihiambo and Camarero (2019) explored the causal relationship between government debt servicing and economic growth in Zambia for the period 1979-2017 adopting dynamic multivariate approach. The empirical results indicated unidirectional causal relationship from economic growth to public debt in Zambia.

The foregoing is in agreement with Amaefule and Umeaka (2016), who studied the effects of government's borrowing on infrastructural development in Nigeria. The study embraced the ordinary least square (OLS) to determine the relationship of the variables. Findings from the analysis show a short-term relationship among the variable. The study further revealed a positive relationship between federal government capital expenditure and domestic debt, while no significant relationship between capital expenditure and external debt. The study conclude that external debt has not contributed significantly in the development of Nigerian's infrastructure and the huge external profile of Nigeria even before the debt forgiveness of 2005 to date is not justifiable and is uncalled for.

Karogol (2002), studied the short-run and long-run relationships between economic growth and external debt service in Turkey from 1956 – 1996. The study used a standard production function model analyzed using multivariate co-integration techniques. The Vector Autoregression estimates showed that Co-integration equations exist. The study also revealed that debt service is negatively related to economic growth in the long-run. The causality test shows a unidirectional causality between debt service and economic growth in Turkey within the period under review.

Efuntade, Oladipo and Efuntade (2021) while probing the impact of debt service in stimulating economic growth in Nigeria: mediating on the role of debt service on public sector financial management and found that debt servicing has significant impact on economic growth due to its positive relationship with gross domestic product,. They recommends among others that government should ensure that any debt both internal and external debt should be one that will open Nigeria to greater trade and investment that can stimulate the economic growth of the country.

Conversely, Amadi et al (2020) examined the effect of external debts on economic growth in Nigeria covering the period of 1984 to 2019, the study employed an econometrics techniques rooted in bound test to analyze the long run relationship between external debts and economic growth. Their study established a long run relationship between external debts and economic growth. The result also revealed that external debt has a negative and significant effect on economic growth in Nigeria.

In the study conducted by Kalu (2016), ordinary least square regression method and the Granger causality test was employed to analysis the impact of debt service payment on economic growth in Nigeria from 1981 to 2013. The study revealed that DSP proved to be a positive and significant function of economic growth while the causality tests showed a bidirectional causality running for DSP to GDP.

Isaac and Rosa (2016) examined the effect of public debt and public investments on economic growth in Mexico for the period 1993-2012 using dynamic models of panel data and the generalized method of moments in the analysis. The variables used in the study were a nominal budget deficit, public income, public spending, volume of interest paid, the nominal effective rate of interest and the total value of domestic public debt. The empirical result showed that public debt has a positive influence on public investment and economic growth in the economy.

Tamunonimim (2014), empirically investigated the relationship between domestic debt and poverty in Nigeria from 1986-2012. The study adopted ordinary least square (OLS), vector autoregressive (VAR), Granger causality approach and Johansen cointegration techniques to analysis the work. Estimated results revealed that there is a long run relationship between poverty (measured by real gross domestic product, per capital gross domestic product and basic secondary school enrolment) and domestic debt in Nigeria.

Malik**,** Hayat and Hayat, (2010) investigated the relationship between external debt and economic growth in Pakistan over the period 1972 to 2005 using time series econometric technique. Their result indicates that external debt is positively and significantly related to economic growth. The evidence suggests that increase in external debt would lead to rise in economic growth.

Adesola (2009), examined the effect of external debt service payment practices on sustainable economic growth and development in Nigerian from 1981 to 2004. The study employed Ordinary Least Square estimating technique for the analysis. their findings revealed that debt service payment to foreign creditors exerted positive impact on sustainable economic growth and development.

Butts (2009), empirically examined the effect of external debt service payment practices on the economic growth of Nigeria. Ordinary Least Square method of multiple regressions was adopted to investigate the relationship betwen debt payment to multilateral financial creditors, Paris club creditors, London club creditors, Promissory notes holders and other creditors to gross domestic product (GDP).

Hameed, Ashraf and Chaudhary (2008) investigated the dynamic effect of external debt servicing, capital stock and labor force on the economic growth for Pakistan for a period of 1970-2003. They discovered an adverse effect of external debt servicing on labor and capital productivity which in the end impedes economic growth. Also Adepoju**,** Salawu and Obayelu, (2007) evaluates the effects of debt service management on the economic growth of Nigeria between 1962 and 2006 using time-series data rooted in econometric technique . Their study observed that proper debt service management have positive impact on Nigeria's economic growth.

**Methodology**

The study employed the Autoregressive Distribution Lag (ARDL) model developed by Pesaran, Shin and Smith in 2001 and Granger causality method to analysis the work. Augmented Dickey-Fuller (ADF) unit root test was applied to test for stationarity of the data. Also the bounds test and Granger causality test were utilized to determine the presence of long-run relationship and the direction of causality among the variables respectively.

**Mode Specification**

For straightforwardness the study settled in a model used by Awa and Alo (2022) and little modification was made to suit the objectives of the study.

$$CEP = f(DSS, DMD, FOD, EXR) \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Econometrically, the model in equation (1) can be re-organized as follows:

$$CEP = \beta_0 + \beta_1 DSS + \beta_2 DMD + \beta_3 FOD + \beta_4 EXR + \varepsilon_t \ldots\ldots\ldots\ldots \quad (2)$$

In reference to equation (2) the long run ARDL model is specified as:

$$\Delta InCEPt = \beta_0 + \beta_1 \Delta lnDSS_{t-1} + \beta_2 \Delta lnDMD_{t-1} + \beta_3 \Delta lnFOD_{t-1} + \beta_4 \Delta EXR_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots \quad (3)$$

The short run dynamic model is presented as thus:

$$\Delta InCEPt = \beta_0 + \beta_1 \Delta lnDSS_{t-1} + \beta_2 \Delta lnDMD_{t-1} + \beta_3 \Delta lnFOD_{t-1} + \beta_4 \Delta EXR_{t-1} + \beta_5 \Delta ECT_{t-1} + \varepsilon_t \ldots\ldots (4)$$

Where:

CEP = Capital expenditure proxy infrastructure

DSS = Debt Services
DMD = Domestic Debt
FOD = Foreign Debt
EXR = Exchange Rate

While, $\varepsilon$ = Error term, $\beta_0$ is the constant and $\beta_1 - \beta_4$ are estimated coefficients.
The Granger causality equation is specified as follows:

$$Y_t = \alpha i + \sum \alpha i A_{t-i} + \sum \beta_t B_{t-j} + U_{1t} \quad (5)$$

$$X_t = bi + \sum \lambda_i A_{t-i} + \sum \delta_j B_{j-1} + U_{2t} \quad \ldots\ldots\ldots\ldots\ldots \quad (6)$$

Where B and A represents debt services and infrastructure respectively. It was assumed that the disturbances U1t and U2t are uncorrelated. The Granger causality normally produces three outcomes. Firstly, is bidirectional which happen when we reject both null hypotheses, which shows that debt service and infrastructure coefficients are statistically significant. Second is the unidirectional causality which occurs when we accept one of the null hypotheses and reject other, showing that either the causality runs from debt service to infrastructure or from infrastructure to debt service. Thirdly occurs when we accept both null hypotheses, it means that there is independence. This revealed that the coefficient of the set of the independent and dependent are not statistically significant in both regressions (Gujarati, 1995).

**Data Sources, Measurement and A priori Expectation**

The study exploited the annual time series data from 1986 to 2022 fiscal year. The data were sourced from the National Bureau of Statistics and Central Bank of Nigeria Statistical Bulletin. Capital expenditure was proxy as infrastructural indicator. Huge debt service is assumed to reduce infrastructural development while domestic and foreign debts are expected to increase infrastructural development. However, the expected signs of the coefficient of the variables are negative, positive and positive for debt service, domestic debt and foreign debt respectively.

**Results and Discussion**

Trend Analysis

**Stationarity Test**

The study employed Augmented Dickey- Fuller (ADF) unit root test to test for the stationarity of the data. The results are displayed below

**Table 1:** Stationarity Results

| | At Levels | | At 1st Difference | | | |
|---|---|---|---|---|---|---|
| Variables | ADF statistics | Critical value at 5% | ADF statistics | Critical value at 5 % | Order of integration | Decision |
| CEP | -1.683 | -2.865 | -9.213 | -2.765 | 1(1) | Stationary |
| DSS | -3.643 | -2.965 | — | — | 1(0) | Stationary |
| DMD | -1.443 | -2.912 | -5.754 | -2.954 | 1(1) | Stationary |
| FOD | -1.563 | -2.965 | -4.402 | -2.874 | 1(1) | Stationary |
| EXR | -4.743 | -2.961 | — | — | 1(0) | Stationary |

**Source:** Author's computation (2023)

The unit root result indicates that CEP, DMD and FOD were stationary at first difference 1(1), while DSS and EXR were stationary at level 1(0). The mixed order of integration by the variables supported the use of Autoregressive Distributed Lag (ARDL) model.

**ARDL Bounds Test for Co-integration**

To test for long run relationship among the variables, the study employed bounds test.

**Table 2:** Bounds Test Co-integration Results

| Test Statistics | Value | Sign Level | I(0) | I(1) |
|---|---|---|---|---|
| F-statiatics | 3.49254 | 10% | 2.08 | 3.0 |
| K | 5 | 5% | 2.40 | 3.37 |
| | | 2.5% | 2.69 | 3.74 |
| | | 1% | 3.05 | 4.25 |

**Source:** Author's computation (2023)

Table 2 shows the results of the bound test for co-integration and the results revealed that the calculated F- statistic is 3.49254 which is greater than the 5 percent upper bounds critical value 0f 3.37. This discloses that there is a long run relationship among the variables under review.

**Table 3:** Estimated Long-run Co-efficient
Dependent variable: CEP

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| C | 32I.9932 | 59.10555 | 5.447764 | 0.0000 |
| DSS | -0.04206 | 0.05257 | -0.800015 | 0.0450 |
| DMD | 2.702446 | 2.043425 | 1.301257 | 0.0300 |
| FOD | -1.084653 | 0.466495 | -2.325110 | 0.0327 |
| EXR | -2.614077 | 13.41046 | 0.194928 | 0.8470 |
| R-squared | 0.722167 | F-statistic | 8.119560 | |
| Adjusted R-squared | 0.671376 | prob(F-statistic) | 0.00000 | |
| Durbin-Watson Stat | 1.709762 | | | |

**Source:** Computed by the Author (2023)

The estimated long run result in Table 3 indicates that debt service has a negative and significant effect on infrastructure. The coefficients of domestic and foreign debt were found to be positive and negative respectively and statistically significant at 5% level. This result implies that one percent increase in debt services would decrease infrastructure by approximately 0.04 percent. The finding of this is in line with the study by Awa and Alo (2022).

Domestic debt (DMD) was discovered to have a positive and significant effect. This positive effect of domestic debt on infrastructure could be due to the huge domestic debt profile in the country. This is in agreement with results obtained by Amaefule and Umeaka (2016). While foreign debt (FOD) has a negative effect on infrastructure. This result is amazing even with huge foreign debt in Nigeria. This could be attributed to corruptions and diverting of foreign debt foreign from the original purpose of acquiring the loan. Furthermore, the estimated coefficient of exchange rate showed a negative and insignificant association with capital expenditure (infrastructure).

The value of R-square is 0.722, indicating that about 72% variations in the dependent variable capital expenditure (infrastructure) is accounted for by changes in explanatory variables. The results still remain robust after adjusting for degree of freedom as shown by the value of adjusted coefficient which is 0.67. This indicates a good fit. F-statistic of about 8.119 indicates that all the variables are jointly statistically significant. The Durbin-Watson statistic of 1.7 indicates completes absence of autocorrelation.

**Table 4:** Short-Run Estimated Results
Dependent variable: CEP

| Variable | coefficient | Std.Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| D(DSS(-1)) | -0.759953 | 0.163321 | -4.653112 | 0.0009 |
| D(DMD(-1)) | 75.16256 | 15.04906 | 4.994502 | 0.0005 |
| D(FOD(-1)) | -0.034533 | 0.014746 | -2.341867 | 0.0302 |
| D(EXR(-)) | -0.615252 | 0.326275 | -1.885686 | 0.0765 |
| C | 327.29120 | 58.25461 | 5.618288 | 0.0000 |
| ECM(-1) | -0.461482 | 0.213160 | -2.141499 | 0.0389 |

| | | | |
|---|---|---|---|
| R-squared | 0.87.0223 | F-statistic | 28.65035 |
| Adjusted R-squared | 0.839459 | Prob(F-statistic | 0.000000 |
| Durbin-Watson Stat | 1.714370 | | |

**Source:** Computed by the Author (2023)

Results in Table 4 indicate that the lagged value of debt service (DSS) in negatively associated with capital expenditure. The coefficient of debt service is -0.7599 meaning debt service decrease capital expenditure (infrastructural development) by approximately 0.75 percentage point. These suggest that for every one percent increase in debt service, infrastructure will reduce by about 0.75 percent. This is in collaboration with study by Awa and Alo (2022).

The result also indicates that the impact of domestic debt on infrastructure is positive. Meaning that, one percent increases in domestic debt increases infrastructure by about 75.16 percent. Similarly, foreign debt was discovered to have a negative and significant effect on infrastructural development in Nigeria which is contrary with the a priori expectation. The reason for the negative result could be attributed to huge corruption in the system where borrowed fund were directed to private pockets or projects were sited based on tribal consideration instead of merit. Another reason is misallocations of borrowed fund to projects incapable of creating wealth or debt incurred were channels to social investment in expense of capital investment. The coefficient of ECM is negative and significant implying that about 46 percent of the disequilibrium would be restored within the period under investigation.

**Table 5:** Diagnostic Tests

| Tests | F-statistics | Probability |
|---|---|---|
| Serial Correlation | 0.732456 | 0.76543 |
| Heteroscedasticity | 1.245622 | 0.12450 |
| Normality Test | 5.352671 | 0.07543 |
| Ramsey Test | 0.047823 | 0.83333 |

**Source:** Author's computation (2023)

The result of diagnostic test in Table 5 above point out that the model passes serial correlation, heteroskedasticity, Ramsey and normality test. The F-statistic and corresponding P-values appear greater than 5 percent showing that the model is free from heteroskedascity, autocorrelation and misspecification bias.

**Table 6:** Granger causality Test

| Tests | obs | F-statistic | Prob. |
|---|---|---|---|
| CEP does not Granger Cause DSS | 36 | 2.02546 | 0.0882 |
| DSS does not Granger Cause CEP | | 7.01901 | 0.0200 |
| DMD does not Granger Cause DSS | 36 | 2.57010 | 0.0798 |
| DSS does not Granger Cause DMD | | 2.21892 | 0.1121 |
| FOD does not Granger Cause DSS | 36 | 5.92745 | 0.0021 |
| DSS does not Granger Cause FOD | | 4.76721 | 0.0045 |
| EXR does not Granger Cause DSS | 36 | 4.02412 | 0.0034 |
| DSS does not Granger Cause EXR | | 2.31043 | 0.0832 |

**Source:** Author's Computation (2023)

The results of Granger Causality indicate that a unidirectional causality runs from CEP to DSS and is significant at 5% level as shown by the low P-value of 0.0200, meaning that debt service causes infrastructural development to shrink. This finding suggest that debt service reduces the amount budgeted for capital expenditure. Similarly, the result of hypothesis two

and three indicates evidence of independent causality running from DMD to DSS and FOD and DSS. This finding implies that both domestic and foreign debts do not affect debt services and debt service does not affect them either. Further evidence of unidirectional causation was found between foreign debt (EXR) and debt service (DSS) showing that exchange rate help to determine the size of debt service in Nigeria.

**Conclusion**

The study examined the effect of debt service payment on infrastructural development of Nigeria. Econometric techniques were employed to determine the relationship. The literature shows various arguments that were put forward on the effect of debt service on infrastructural development. Some researchers believe the relationship is positive while others argued that it is negative.

Based on the results, the study found that debt service has a negative effect on infrastructural development suggesting that debts service reduces the amount budgeted for capital expenditure (Infrastructure). The study affirms that domestic debt has contributed positively in the development of infrastructure in Nigeria. In the same token, the study confirmed that foreign debt has not contributed positively in the development of infrastructure in the country. Thus, the huge foreign debt profile is not judicously utilized and in the long run are adverse to infrastructural development which is occasioned by huge debt service cost. Thus the study concludes that debt service is not infrastructural development enhancing. Therefore caution should be excercise with respect to rate at which loan are taking from outside the sore of this country.

**Recommendations**

In line with the findings and conclusion, the study recommend the following to the government

1. Foreign loan generally should be discarded except for uncontrollably cases where foreign borrowing becomes the last resort.
2. Government should diversify and look for alternative means of raising fund to finance her project instead of depending heavily on borrowing.
3. Borrowed fund should be channeled and invested in projects capable of servicing the debt on it own instead of borrowing for social service of welfare.
4. Government should expand her tax base so as to raise more revenue.
5. Government should strengthen and overhaul institutions saddled with responsibility to manage and monitor public debt.

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# Gender Equality and Sustainable Economic Development Strategies in Nigeria

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## Abstract

This article explored the linkages between gender equality and sustainable economic development strategies in Nigeria. The peculiarities and patriarchal construct remain the bane across vitually all spheres of life in the society. There is a greater level of gender sensitivity to the extent that boys are brought up to see themselves as superior sex to girls and such, boys feel stronger, more important and indispensable, while the female gender are trained to see themselves as weaker sex or even as appendages to the men folk. Efforts were also made to interrogate at those factors that drive economic development as they relate to gender and the place of gender equality in sustainable economic development was highlighted. It examined how traditional belief systems and cultural practices like widowhood and female genital mutilation rites in certain part of Igbo land in the South East and in Yoruba land in the West, the Ba Shiga in Hausa land in the North, just to mention but a few underpin cultural division of roles between male and female and increase, the vulnerability of women in accessing economic empowerment. The article thus argued that decision making process within the household is not only complex, but it is also influenced by social and cultural norms. It also noted that inequalities in the allocation of resources matter because education, health and nutrition are strongly linked to human well-being, economic efficiency, and growth, and that low level of educational attainment and poor health and nutrition affect individuals' capacity to work productively. Economic inefficiency represents a significant loss to society and hampers sustainable economic growth and development. This paper therefore argued that the restriction of the activities of women who constitute half of the population of the country to occupations such as small-scale businesses and low-income earning jobs hinders sustainable economic development. The work relied extensively on secondary source materials and data were analyzed thematically. The study concluded that putting women and girls at the centre of economic activities will fundamentally achieve or result in more and better sustainable development outcomes. It is the view of the author that concerted efforts should be made towards changing gender and social norms to address inequalities in power and privileges between persons of different gender as one of the effective strategies for sustainable economic development in Nigeria.

**Keywords:** *Gender, Equality, Sensitivity, Sustainable Economic Development, Strategies.*

**Background to the Study**

Extant literature has shown that gender sensitivity has become a burning issue in recent years, basically because of persistent agitations by women activists. The female gender in Africa especially, in Nigeria seemed to be culturally suppressed resulting in upsurge in literature which is triggered by various feminist movements such as Women in Nigeria (WIN) Federation of Nigeria Women's Association, Non- governmental Women's Human Right Organization, Aba Market Women Organization, Abeokuta Women's Union etc. These organizations attend to different women's issues within the private sphere of the family and in the public arena, in such areas as sexual and reproductive health, poverty, economic empowerment, violence against women, property ownership, peace and security, leadership development and political participation among others[1]. It is common knowledge that in most parts of the country, there are deep rooted prejudices against the female gender as she encounters various forms of discrimination, physical and emotional torture that pervades all aspects of their life, and promoting gender equality has therefore become an important part of the development strategy that seeks to enable both women and men to diminish their poverty and improve their standards of living. As a matter of fact, there is now a global consensus on a comprehensive approach to sustainable development, and a critical aspect of the consensus is that there can be no sustained development without attainment of gender equity and economic justice[2].

Gender based violations of human rights and other forms of discrimination against women and girls can exacerbate their vulnerability, thus, the International Labour Organizations (ILO) declared that achieving gender equality in the world remains a major challenge for the labour movement in the world because, securing a sustainable and equitable recovery, and a fair globalization demands gender awareness responses[3]. By ending gender-based violence and empowering women, the nations can alleviate poverty. It has also been said that ending all forms of discrimination against women and girls is not only a basic human right, but it also has a multiplier effect across all other development areas.

Furthermore, the total development of society involves not only changes in economic activity but the achievement of economic, political, educational, social and cultural equity between men and women as it has currently become a core objective of the national development agenda. It is in the realization of this objective that the United Nations devoted a decade (1975-1985) to issues concerning women and development. A fellow up to this was the International Conference on Population and Development (ICPD), Cario 1994. This Conference stressed the importance of effective promotion of gender equality and empowerment of women if the goals of sustainable development are to be attained. This was again reinforced at the World Summit on social Development (Copenhagen, 1995), and the Beijing Platform for Action adopted at the Fourth World Conference on women (FWCW) in 1995, and their respective five-year reviews[4].

In assessing sustainable economic development of a Nation, economics tends to focus primarily on economic changes and thus isolates economic development from 'total' development. The general consensus remains that 'it is conventional to begin with an increase

in per capita real income as the best available overall index of economic development[5]. This is because both women and men continue to feel the impact of the economic crisis. Hence achieving gender equality remains a major strategy for the attainment of sustainable economic development.

Historically, gender inequalities in basic rights persist in all regions and limit the sets of choices available to women in many aspects of life. In much of Sub-Saharan Africa, Nigeria inclusive, women lack independent rights to own land, manage property, conduct business or even travel without the consent of their husbands. They continue to systematically have low control over a range of productive resources, including education, land, information, financial resources and weaker ability to generate income[6]. Although, female education levels have improved considerably thus reducing the large gender gap in schooling, the World Bank Policy Report say that if women labour is given a proper market value, women would emerge as the major breadwinners in most societies. In the home they perform the triple role of reproducers, child bearers and caretakers or managers of resources. They contribute significantly to the reduction of hunger and poverty, promotion of family welfare and to the overall growth of a nation's economy. Unequal rights and poor socio-economic status in relation to men further limit their ability to influence decisions at both community and national levels. Very few women have had the opportunity of being part of the decision-making processes of their societies while politics is regarded as an exclusive preserve of men. From the personal level to the highest reaches of decision-making power, women face discrimination, deprivation and violence[7].

Be it as it may, it is pertinent to note that many women liberation movements have made efforts to canvass the issue of women especially on the perceived injustice to the establishment gender equality in Nigeria. Some of their notable achievements include the introduction of the 35% affirmative policy in terms of elective position in Nigeria, political appointments and formation of political parties. But despite the socio-economic strides made in development and gender equality, women's representation in parliament still remains minimal[8]. In 2015, all countries made a commitment to achieving gender equality through the adoption of the Sustainable Development Goals (SDG) These include the elimination of gender- based violence and discrimination against women and girls in all its forms. Member states reaffirmed that achieving gender equality, the empowerment of all women and girls and the full realization of their human rights are essential to achieving inclusive economic growth. It has been observed that despite the significant progress made incent decades, labour markets across the world remain divided along gender lines. Female labour force participation has remained lower than male participation, gender wage gaps are high, and women are overrepresented in the informal sector and among the poor.

Gender and development approach serves as a transitioning point in the way in which feminists have understood development. It serves as a comprehensive overview of the social, economic and political realities of development. It origin dates back to the Development Alternative with Women for New Era (DAWN) network in, when it was first initiated in India. The DAWN programme was officially recognized in 1986 during the Third UN conference on Women in Nairobi[9]. The conference brought together activist's researchers and development

practitioners across the globe. The conference discussed the achievements made from the previous decade's evaluation of promoting equality among the sexes, and a full scope of the obstacles limiting women's advancements, especially in the developing world. The forum also discussed the effectiveness of the continuous debt crisis and structural adjustment programme implemented by the International Monetary Fund (IMF) and the World Bank, and how the concept of neoliberalism tends to marginalize and discriminate against women more in developing countries. The goals were to prove that the unequal relationship between the sexes hinders sustainable development and female participation in the affairs of the state.

Additionally, it sorts to change the structure of power into a long-term goal whereby all decision- making and benefits of development are distributed on equal basis of gender equality. The gender and development approach is not just focused on biological inequalities among sexes: men and women, but also on how social reproductive and economic roles are linked to gender inequalities. There is therefore need to address this man-made issues as a strategy for achieving sustainable economic development.

**Methodology**

This article relied extensively on secondary sources which comprises review of books, journals, proceedings of seminars and other works on related topics both published and unpublished and data were analyzed thematically. Primary data that comprised interviews mostly unstructured interviews were used too and factors like age, educational attainment were considered.

**Gender Inequality and Development**

Gender is culture specific; it is used to refer to specific cultural patterns of behaviour that are attributed to human sexes. The term refers to neither male nor female gender specifically but relates to cultural attributes of both male and female[10]. Gender inequality therefore refers to the hidden disparities among individual based on gender. These disparities include discrimination in terms of wealth, opportunities, resources, services, benefits, decision-making, status, power and influence. Individuals are oriented towards the type of behaviour expected of them on the basis of being a male or female in a particular society. Most of the institutions in the society, such as political, economic, religious, marriage and educational institutions are developed and dominated by men around the world. The disparities that exist disadvantage women and girls and limit their capacity to participate in and benefit from development. The term gender is a social construct that establishes and differentiates statuses and roles between men and women particularly in the way they contribute to, participate in, and are rewarded by the economy and the prevailing social systems. It is therefore obvious to state that development or progress in people's welfare cannot be achieved where the needs and contributions of "half of the world's population, women" are continually downgraded, marginalized or completely ignored[11].

Development that supports the security and regeneration of economic natural, human and social resources cannot be achieved if women are neglected. Thus women in Nigeria and in other parts of the globe must be systematically included in development efforts in order to

change their subordinate status in the society. Their participation is crucial for the achievement of sustainable economic development. Gender concerns both men and women, therefore understanding gender means understanding opportunities and constraints as they affect both women and men. At the same time, issues such as men's reproductive health needs and sexual responsibilities, have until recently not received adequate attention, that is to say, that gender was not recognized as a variable relevant for promoting economic or human development. Many development agencies, having recognized that attaining gender equity and equality could lead to sound social and economic development are pursuing projects to achieve this goal. According to World Bank Report, the failure to include women in all aspects of life is responsible for the continued underdevelopment of countries in Sub-saharan Africa. Countries that reduce the gender gap in access to resources and opportunities achieve more rapid economic growth. The report also stated that agricultural productivity in Africa could in a short time, be increased by 20 percent if the access of women in the rural areas, is improved to education, land and fertilizer is improved considerably[12].

As the World Bank's report "Enhancing women participation in Economic Development" captured it:

> *Social and economic losses are greatest when women are denied access to basic education and health care (and) investing in women will generate import and benefits for society in the form of lower child mortality, higher educational attainment, better nutrition and slower population growth.*[13]

Gender equality, therefore, should be seen within a dynamic system of relations embedded in a development process that seeks to empower its actors and gives equal opportunities for both women and men to participate and benefit.

**Sustainable Economic Development in Nigeria**

Sustainable development has been defined as the development that meets the needs of the present without compromising the ability of the future generations to meet their own needs[14]. It then implies that sustainable development cannot be achieved without a more equitable distribution of resources and the eradication of poverty. In other words, empowering women means giving them the opportunity to get out of abject poverty. Women not only constitute the vast majority of the world's poor, but they are at higher risk of poverty compared to men[15]. It is pertinent to stress here that poverty does not only refer to material resources such as money, housing or food, but also to social resources like access to education, quality healthcare, good nutrition, and even meaningful relations with other people.

Sustainable economic development is therefore directly concerned with increasing the material standards of living of the poor at the 'grassroots' level, which can be quantitatively measured in terms of increased food, real income, educational services, healthcare, sanitation and water supply, emergency stocks of food and cash, etc, and only indirectly concerned with economic growth at the aggregate, commonly national level[16]. In general terms, the primary objective of sustainable economic development is to ensure that the poor have access to

sustainable and secure livelihoods, that is reducing the absolute poverty of the world's poor through providing lasting and secure livelihoods that minimize resource depletion, environmental degradation, cultural disruption, and social instability[17].

In addition, for economic development to be truly 'sustainable' it requires 'tailoring the design and implementation of projects to the needs and capabilities of people who are supposed to benefit from them[18]. For instance, in some rural community's institutional sustainability could mean reinforcing societal norms that inhibit women's economic independence and limit their social participation in government. This however may conflict with rural women organizing themselves to secure increased social justice, participation, and access to Land, Credit, Skills etc[18]. Similarly, eliminating all forms of violence against women and girls is not only an essential component of sustainable development goal strategy but is also critical to ensuring healthy lives and well- being for people of all ages. The health consequences of violence against women and girls extend to their children, who may witness the abuse and suffer long term trauma that impacts their physical, emotional and social development. Understanding and addressing the disparate impact that economic development and globalization have on people based upon their location, gender, class, background and other socio-political identities is therefore an effective strategy for sustainable economic development.

**Cultural Practices that hinder the Female Gender in Nigeria**

The female gender in Nigeria is marginalized, stereotyped and humiliated in various ways resulting in negative impacts on them such as depression, physical disability and even inability to meaningfully contribute to sustainable economic development. Some of the cultural practices include, female genital mutilation, widowhood rites, the Purdah system, Early marriages, violence against women, Gender bias and Nutritional taboos. These harmful cultural practices, however, have received global attention due to their severe negative impact on the health and well-being of the female, but efforts at eradicating these practices are often met with suspicion or hospitality from those communities practicing them, particularly when efforts originate from outside the community.[19]

Female genital mutilation ranges from a minor ritual cutting to racial surgery which causes major sexual and reproductive health problem and its complication includes chronic infections, infertility problems during pregnancy and pains during sextual intercourse[20]. The Purdah system prevents Hausa women and young girls of puberty age from going out unescorted and getting 2involve in public life and activities. Widowhood rites, especially in Igboland portray situations where women are subjected to certain cultural practices that strip them of their rights as human.

Due to gender biased sex-role orientation, the women's place in the traditional Nigerian culture was considered as primarily the home. The women were not expected to venture into areas that reduce her chances of being involved with home keeping and child rearing and caring. Her status and effectiveness were well appreciated within these stereotyped situations. It therefore means that anything outside these was frowned at and ascribed as not dignifying for a woman and therefore discouraged. Consequently, women did not have to strive to excel

or achieve, especially as it relates to effectiveness in higher positions that will enhance sustainable economic growth. Certain cultures in Nigeria forbid women, especially pregnant women from eating some kinds of animals. It is believed that when a woman eats those animals, that the child in her womb will take the form of that particular animal. It should be noted that this marginalization emerges from the structural nature of the unequal relationship between men and women, and its pervasive manifestation straddles every segment of the society.

**The Way Forward**

From the foregoing analysis, the strategies for sustainable economic development in Nigeria shall include but not limited to the following;

1. Increasing the 35% affirmative policy to 50%, this will help to accommodate more women in appointive an elective position in Nigeria.
2. Active support for more female candidates during national, state and local government elections.
3. Policymakers should focus on those laws and traditions that deprive women of their rights as humans, such as access to inherit and own certain reproductive properties like land.
4. Empowering women through agriculture loans and other credit facilities at all levels.
5. Making laws that will not discriminate against the female gender but will rather encourage them to be fully part of the decision- making process.
6. Efforts should also be made towards changing gender and social norms to address inequalities in power and privileges between persons of different gender.
7. It is also necessary to emphasize that a proper understanding of the effects of economic development and globalization on people based on their gender, class backgrounds and other socio-political identities constitutes one of the effective strategies for sustainable economic development.
8. Women labour should also be given adequate market value.
9. Some critical areas that concern women such as women's health, discrimination, deprivation, marginalization, violence against women, increased resources for women, qualitative and quantitative education for women and poverty eradication should be given paramount attention.

**Conclusion**

Conclusively, this paper raises a compelling case for the state to intervene in promoting gender equality. The challenge is for a better understanding of the link between gender and sustainable economic development. Policy makers also need to reflect this links in policy such that gender equality and economic efficiency is promoted. The paper thus concluded that sustainable economic development argues that real improvements cannot occur unless the strategies which are being formulated and implemented are ecologically sustainable over the long term and are consistent with social values and institutions and encourage grassroots' (women) participation in the development process. In all societies women and men's roles are socially constructed, but all too frequently gender-based disparities exist that disadvantage women; and impede their development and hence that of humankind.

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# Monetary Policy and Economic Growth of Nigeria: Time-Series Evidence from Nigeria (1981-2022)

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**Abstract**

The study examined the impact of monetary policy on economic growth of Nigeria; for the period 1981-2022. Secondary data were collected from the Central Bank of Nigeria Statistical Bulletin. The study used Gross Domestic Product as proxy for economic growth and employed as the dependent variable; whereas monetary policy rate, Cash Reserve Ratio, Treasury Bills and liquidity rate respectively were used as the explanatory variables to measure monetary policy. Hypotheses formulated were tested using Autoregressive Distributed Lagged (ARDL) Bound co-integration test ECM. The study revealed that Cash reserve ratio (CRR) and Treasury Bill Rate (TBR) were positive and statistically significant on Gross Domestic Product in Nigeria. Monetary Policy Rate (MPR) has a negative and is statistically significant to economic growth in Nigeria. While Liquidity ratio had a negative and insignificant impact on Gross Domestic Product in Nigeria. The ECM result reveals that the error correction term is negative and statistically significant and this corroborates and shows evidence of a certain return to the short run equilibrium in the model. Therefore, the study recommends that monetary authorities should give priority attention to CRR and TBR monetary policy tool as it will produce a more desired result in terms of economic stabilization.

**Keywords:** *Monetary policy rate, Cash reserve ratio, Liquidity ratio.*

**Background to the Study**

Monetary policy is certainly one in every of the key drivers of economic development through its impact on economic variables. Economic growth is important in an economy because it is anticipated to steer to a discount within the level of poverty, help narrow the inequality gap within the society, create employment moreover as improving livelihoods. The growing importance of monetary policy as opined by Chipote and Makhetha-Kosi (2014) has made its effectiveness in influencing economic growth a priority to most governments. Nkoro (as cited in Chipote & Makhetha-Kosi, 2014) pointed that despite the dearth of consensus among economists on how monetary policy actually works and on the magnitude of its effect on the economy; there's an interesting strong agreement that it's some measure of effects on the economy.

The Nigerian economy for the past decades has been facing myriads of economic challenges such as persistent fiscal imbalances exacerbated by loss-making public enterprises; extensive government intervention in the economy through regulations and restrictions on the private sector and on foreign trade; low growth rate of income; poor control of inflation; high rate of unemployment; recurring balance of payment crisis and financial repression and the structurally resource allocation. Experience shows that the sustained implementation of policies to address such shortcomings does, over time, lead to substantial improvements in economic performance (Falade & Folorunso, 2015).

The economy has also witnessed times of expansion and contraction, but evidently, the reported growth has not been a sustainable one as there's evidence of growing poverty among the populace, (Ufoeze, Odimgbe, Ezeabalisi & Alajekwu, 2018).

**Statement of Problem**

No economy is protected from economic instability such as high unemployment rate, balance of payment disequilibrium, inflation, unsustainable growth rate etc. like we experience here in Nigeria. Economic fluctuations in Nigeria with its attendant growth problems can be attributed to some domestic and external factors.

Most of the studies in monetary concentrates on how monetary policies as a whole affects economic growth without highlighting the policy instruments and examine the extent to which each actually contributed to the growth in the economy. Few works have been done using Monetary policy rate, Cash Reserve ratio and liquidity rate as proxies for monetary policy of which their empirical findings indicates Interest rate, monetary policy rate had negative relationships with economic growth while Cash reserve ratio had positive relationship with economic growth. Cash Reserve ratio has a positive and significant impact on economic growth while Monetary policy rate interest and liquidity rate on the other hand had negative but highly significant impact on GDP, (Anowor & Okorie, 2016).

Therefore, the problem of this work is to investigate and ascertain the impact of the aforementioned monetary policy tools on the economic growth of Nigeria.

**Objectives of the Study**

The main objective of this study is to examine the impact of monetary policy on economic growth of Nigeria. The specific objectives include to:

i. Determine the impact of monetary policy rate on economic growth in Nigeria.
ii. Examine the effect of Cash Reserve Ratio on economic growth in the Nigeria economy.
iii. Ascertain the impact of liquidity ratio on economic growth in Nigeria
iv. Evaluate the impact of Treasury Bill Rate on economic growth in Nigeria.

**Research Questions**

The following research questions will help to achieve the above objective

i. What is the relationship between monetary policy rate and economic growth in Nigeria?
ii. What is the relationship between Cash Reserve Ratio and economic growth in Nigeria?
iii. To what extent does the liquidity ratio impact on the GDP in Nigeria?
iv. To what extent does the Treasury Bill Rate impact on economic growth in Nigeria?

**Research of Hypothesis**

Ho1: Monetary policy rate has no effect on economic growth in Nigeria.
Ho2: There is no significant relationship between Cash Reserve Ratio and economic growth in Nigeria.
Ho3: liquidity ratio has no significant effect on economic growth.
Ho4 Treasury Bill Rate has no significant relationship on economic growth.

**Review of Related Literature**

**Conceptual Framework**

Monetary policy can be explained as the decisions and actions undertaken by the central banks to manage money supply and availability of credit in the economy. A majority of the economies, in the present-day scenario, make use of the monetary policy initiatives to foster economic growth and propel economic momentum. Among the top monetary policy tools available for the policymakers is the management of the interest rates in the economy. Policy interest rates are used to control the supply of money in the economy, in the sense that as the interest rates increase in the economy, the supply of money is limited which limits the demand of money as the acquisition of funds becomes more expensive, (Bernanke, 2020).

The monetary policy has affected the money supply of Nigeria by adjusting interest rates, the necessity of the central bank for financial reserves, trade of governmental securities, and management of exchange, (Okorie, Sylvester & Simon-Peter2019). Bodunrin, (2016), defined those two approaches followed in monetary policy, i.e. expansionary, and contractionary monetary policy. The contractionary monetary policy is employed to decrease the availability of money and increase the interest rate; on the opposite hand, the expansionary monetary policy increases the supply of money and reduces the rate of interest.

Nwoko, Ihemeje and Anumadu, (2020), further defined that the Nigerian government depends on monetary policy to achieve its macroeconomic goals and objects, i.e. creating jobs, making the economy grow and develop, managing the balance of payment, and managing the steadiness of costs.

**Theoretical Framework**

The study adopted the "quantity theory" of money and the liquidity preference theory to explain the effect of monetary policy on growth in Nigeria.

**The Classical View of Monetary Policy**

The classical economists' (Fisherian, 1911) view of monetary policy is based on the quantity theory of money. The quantity theory of money is usually discussed in term of Fisher's equation of exchange, which is given by the expression MV = PT.

The classical quantity theory of money states that the price level is a function of the supply of money. Algebraically, MV=PT where M, V, P, and T are the supply of money, velocity of money, price level and the volume of transactions (or real total output). The equation tells that the total money supply MV equals the total value of output PT in the economy. Assuming V (the velocity of money) and T (the total output) to be constant, a change in the supply of money (M) causes a proportional change in the price level (P).

**Keynesian View of Monetary Policy**

The direct and proportionate relationship between money and price was not accepted by Keynesian theory (1936). They both agree that it is done indirectly through the interest rate. Additionally, they contest the idea that because T in the equation of exchange may be viewed as fixed, the economy is always at or close to its natural level of real GDP. Additionally, they disagree with the idea that the rate at which money circulates is constant. Keynesians contend that an expansionary monetary policy lowers interest rates by increasing the amount of loanable money available through the banking system. When interest rates are lower, aggregate spending on investments and interest-sensitive consumer goods often rises, which increases real GDP. Consequently, monetary policy can influence real GDP indirectly (Gali, 2008; Mankiw & Taylor, 2007).

**The Monetarist View of Monetary Policy**

Monetarist is a school of thought led by Friedman (1963). This school of thought is a modern variant of classical macroeconomics. They developed a subtler and relevant version of the quantity theory of money. Like any school of thought, Friedman (1963) emphasized on the supply of money as the key factor affecting the well-being of the economy and as well, accepted the need for an effective monetary policy to stabilize an economy. He also has the notion that, in order to promote steady growth rate, money supply should grow at a fixed rate, instead of being regulated and altered by the monetary authority(ies). Friedman equally argued that since money supply might be demanded for reasons other than anticipated transaction, it can be held in different forms such as money, bonds, equities, physical goods and human capital. Each form of this wealth has a unique characteristic of its own and a

different yield. These effects will ultimately increase aggregate money demand and expand output.

**Empirical Studies**

The impact of Nigeria's monetary policy on economic growth has been reanalyzed by Anowor and Okorie (2016), using the Error Correction Model methodology. It made use of secondary time series data that covered the years 1982 to 2013. The findings indicated that a unit rise in Nigeria's Cash Reserve Ratio (CRR) caused an increase in economic growth of almost seven units. The outcome was consistent with economic theory since, among other things, monetary policy aims to achieve the macroeconomic goals of steady economic growth and price stability.

The impact of monetary policy on economic growth in Nigeria is examined by Ufoeze et al. in 2018. Time-series data from 1986 to 2016 were used in the study. The unit root and co-integration tests were also run, along with the Ordinary Least Squares approach. The finding of the result demonstrates that the variables have a long-term association. The main conclusion of this study also demonstrated that investment, interest rates, and monetary policy rates have negligible positive effects on economic growth in Nigeria. In their 2020 study, Omodero and Okafor investigate the effects of monetary policy tools on the stability of economic development in Nigeria from 1998 to 2018. The results show that while interest rates and exchange rates had little negative effects on economic growth stability and could not be taken into account at the 5% level of significance, money supply has a large positive influence.

From 1990 through 2019 in the DR Congo, Katuala (2020), looked at the effects of monetary policy on monetary stability (internal and external) and economic growth. In this way, the stability and predictability of the Congolese monetary multiplier were analyzed in order to assess its empirical features. Cointegration, the ADF unit root, and the structural VAR model (B-SVAR) were used. The outcomes showed the following stylised information: (i) The base and the money supply have a stable connection throughout time. This could support the multiplier's use in the DR Congo's monetary and policy targeting; (ii) the shocks to the key rate have not had the anticipated impact on economic growth; (iii) oil prices have stayed stable; and (iv) Demand shocks have an effect on how monetary stability is dynamic.

The importance of monetary policy as a tool for growth in the Ghanaian economy is examined by Abille and Mpuure in 2020. The study included the years 1983 through 2017. The technique of the ARDL limits test was used to look into the cointegration of the variables. The outcomes demonstrated that the variables were cointegrated. The findings also indicated that while the money supply has a big long-term positive impact on Ghana's economy, it has a significant short-term negative impact. However, it was discovered that the loan rate had a considerable beneficial impact on growth in the short term but an insignificant negative impact on growth over the long term.

From 1960 to 2016, Marshal (2019) examines Nigeria's monetary policy transmission channels and economic growth. The vector autoregression model was employed in the

investigation. There are many interesting finds in the study. First, the results of the unit root test demonstrate that although all the transmission channel variables appear stationary at the first difference, they are all non-stationary at level. As a result, all of the series are of order I (1). Naturally, this gave the study permission to move forward with the co-integration test, which showed that there is a long-term connection between Nigeria's monetary policy transmission channels and economic growth. The study continued to estimate the vector autoregressive model after determining that the variables under investigation are co-integrated. According to the baseline outcome of the vector autoregressive model, macroeconomic output in Nigeria and the channels via which monetary policy is transmitted are significantly positively correlated in the short term.

Guenichi and Hamdi (2020), look into how the Tunisian central bank's monetary policy actions affect both overall and sectoral economic growth. The research analyzed quarterly data from 2000 to 2018 using a Vector Error Correction Model. Long-term economic growth is seen to be positively significant with interest rates and negatively significant with inflation.

In his 2020 study, Lee Chin examines the effects of fiscal and monetary policy on economic growth in Malaysia, Singapore, and Thailand between 1980 and 2017. The long-run association was found using the autoregressive distributed lag (ARDL) method. Additionally, a variety of econometric models are used to test the robustness, including the dynamic ordinary least squares technique (DOLS), canonical cointegration regression (CCR), and completely modified least squares method (FMOLS). Since every model produces reliable findings, the outcomes are stable and robust. The primary conclusions of this study show that: (a) interest rates in three chosen countries have a detrimental effect on economic growth. (b) Government spending in Malaysia and Singapore had a negative effect on economic growth, whereas it had a favorable effect in Thailand. (c) Thailand's fiscal policy is more successful than Malaysia's or Singapore's monetary policy. E52, E58, E62, and C01 are JEL classifications.

Ibrahim, (2019), evaluated how Nigeria's monetary policies affected economic expansion. It made use of quarterly data from 1986 to 2018. The Granger causality test and the Autoregressive Distributed Lag (ARDL) model were employed in the study's empirical investigation. The monetary policy rate (MPR) had a favorable impact on economic growth, according to the study's findings, but this effect was not statistically significant. The influence of the wide money supply (M2) as a monetary policy tool on economic growth in Nigeria was much more favorable and statistically significant.

In summary, the overall findings of the works reviewed so far indicate that there is somehow a general consensus that there is a direct relationship between monetary policy and economic growth. However, while the robustness of most of the work reviewed could be widely acclaimed, it will be noteworthy that there are some flaws inherent in some others which could somehow hinder the robustness of their results and which this work is intended to correct.

## Research Methodology

### Preamble

Okpara (2014), ascertain that, the core of any research lies on its methodology since the acceptability and the reliability of the findings depends on the appropriateness of the specified and the analytical tools employed. When models are wrongly or even rightly specified with inappropriate method applied to their analysis, the consequence will be "Spuriosity" of results and hence misleading conclusions.

### Model Specification

This study will be based on monetary policy variables and its impact on the Gross Domestic Product (GDP) and how it affects the economy of Nigeria at large. To indulge in empirical analysis between the monetary policy and economic growth in Nigeria; Gross Domestic Product (GDP) will be used as endogenous variable while; Cash Reserve Ratio (CRR), Monetary Policy Rate (MPR), Treasury Bill Rate (TBR) and Liquidity Ratio (LQR) will be used as the exogenous variables.

Having highlighted on these variables, our complete macroeconomic model for the determination of long-run impact of monetary policy on economic growth are stated first; in its implicit non stochastic form as shown below:

GDP = f(MPR, CRR,TBR, LQR)…….(1)

LnGDPt = b0 + b1MPRt + b2CRRt + b3TBRt + b4LQRt + t ……. (2)

Where;

Where: GDP= Gross Domestic Product as proxy for economic growth

MPR = Monetary Policy Rate

LQR = Liquidity Ratio

TBR= Treasury Bill Rate

CRR = Cash Reserve Ratio

Where; b0 = constant term or intercept.

b1, b2, b3 and b4 = Parameters of the model to estimated

Ut = Error term (Stochastic term)

A critical evaluation of this system of equation will help us draw conclusion on the long run effect of monetary policy instruments on economic growth.

### Result interpretation

The summary of the unit root test results for our variables are presented in table 1.

**Table 1:** Stationarity Test Result

| Variables | ADF @Level | ADF@ 1st difference | Critical Level 1% | Critical Level 5% | Max lag | Order of Integration |
|---|---|---|---|---|---|---|
| LNGDP | -1.047477 | -3.208447 | -3.621023 | -2.943427 | 1 | I(1) |
| CRR | -0.280763 | -5.794335 | -3.621023 | -2.943427 | 1 | I(1) |
| LQR | -1.597936 | -3.4906297 | -3.621023 | -2.943427 | 1 | I(1) |
| MPR | -3.264184 | -8.569458 | -3.615588 | -2.941145 | 1 | I(0) |
| TBR | -3.054809 | -6.779492 | -3.615588 | -2.941145 | 1 | I(0) |

**Source:** Author's regression output

The result in table 1 shows that the independent variable, Gross Domestic Product (LGDP) is stationary at first difference i.e. integrated of order I(1). The variables Cash Reserve Ratio (CRR) and Liquidity Ratio (LQR) were stationary at 1st difference i.e. integrated of order I(1). Finally, Monetary Policy Rate (MPR) and Treasury Bill Rate (TBR) were stationary at level (Integrated of order I(0). The summarized result presented in table 4.1 shows that at various levels of significance (1% and 5%). The difference stationary process (DSP) of the statistical package E-views was used to generate the difference state of the variables. Having determined that the variables are integrated of different orders which justify the use of ARDL (bounds test cointegration) for variables.

**ARDL Co-integration /Bound Test**

**Table 2:** Bound Test

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 7.781611 | 10% | 2.2 | 3.09 |
| K | 4 | 5% | 2.56 | 3.49 |
| | | 2.5% | 2.88 | 3.87 |
| | | 1% | 3.29 | 4.37 |
| Actual Sample Size | 34 | | Finite Sample: n=35 | |
| | | 10% | 2.46 | 3.46 |
| | | 5% | 2.947 | 4.088 |
| | | 1% | 4.093 | 5.532 |
| | | | Finite Sample: | |
| | | 10% | 2.525 | 3.56 |
| | | 5% | 3.058 | 4.223 |
| | | 1% | 4.28 | 5.84 |

**Source:** Author's regression output

In order to ascertain the existence of a long-run relationship among the variables in equation or model above, the F-statistic (Wald test) for the bounds test (Pesaran, 2001) was computed following the ARDL bounds test. The F-statistic and critical bounds values for testing the null

of no cointegrating relationship in table 4.2. The computed F-statistics of 7.78161 was found to exceed the lower and upper bounds critical value of 2.56 and 3.49 respectively for a significance level of 5%. Therefore, the null hypothesis of no cointegration is rejected. This implies, there exists a long run relationship among the variables.

**ADRL Error Correction Regression**

**Table 3:** ADRL Error Correction Regression

ECM Regression
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(GDP(-1)) | -0.335409 | 0.137859 | -2.432986 | 0.0717 |
| DLOG(GDP(-2)) | -0.211681 | 0.102342 | -2.068377 | 0.1074 |
| DLOG(GDP(-3)) | -0.596698 | 0.115452 | -5.168360 | 0.0067 |
| DLOG(GDP(-4)) | -0.604981 | 0.120438 | -5.023169 | 0.0074 |
| D(CRR) | 0.026358 | 0.005359 | 4.918587 | 0.0079 |
| DLOG(CRR(-1)) | 0.039324 | 0.005680 | 6.923592 | 0.0023 |
| DLOG(CRR(-2)) | -0.007400 | 0.005898 | -1.254647 | 0.2779 |
| DLOG(CRR(-3)) | 0.007436 | 0.004403 | 1.688954 | 0.1665 |
| DLOG(CRR(-4)) | 0.013442 | 0.004089 | 3.287339 | 0.0303 |
| DLOG(MPR) | -0.150432 | 0.080263 | -1.874241 | 0.1342 |
| DLOG(MPR(-1)) | -1.108726 | 0.112227 | -9.879277 | 0.0006 |
| DLOG(MPR(-2)) | -0.827586 | 0.136506 | -6.062658 | 0.0037 |
| DLOG(MPR(-3)) | -0.543544 | 0.089202 | -6.093412 | 0.0037 |
| DLOG(MPR(-4)) | -0.568622 | 0.089207 | -6.374190 | 0.0031 |
| DLOG(LQR) | 0.009179 | 0.053566 | 0.171362 | 0.8723 |
| DLOG(LQR(-1)) | 0.068602 | 0.053571 | 1.280587 | 0.2696 |
| DLOG(LQR(-2)) | -0.126399 | 0.081374 | -1.553316 | 0.1953 |
| DLOG(LQR(-3)) | -0.123690 | 0.047089 | -2.626721 | 0.0584 |
| DLOG(LQR(-4)) | -0.061874 | 0.038429 | -1.610068 | 0.1827 |
| DLOG(TBR) | 0.029886 | 0.049939 | 0.598457 | 0.5818 |
| DLOG(TBR(-1)) | 0.129615 | 0.037100 | 3.493699 | 0.0250 |
| DLOG(TBR(-2)) | 0.047971 | 0.057561 | 0.833390 | 0.4515 |
| DLOG(TBR(-3)) | 0.268627 | 0.048113 | 5.583244 | 0.0050 |
| DLOG(TBR(-4)) | 0.285424 | 0.050394 | 5.663884 | 0.0048 |
| CointEq(-1)* | -0.024764 | 0.002416 | -10.24948 | 0.0005 |

| | | | |
|---|---|---|---|
| R-squared | 0.976954 | Mean dependent var | 0.194710 |
| Adjusted R-squared | 0.915497 | S.D. dependent var | 0.103874 |
| S.E. of regression | 0.030196 | Akaike info criterion | -4.020790 |
| Sum squared resid | 0.008206 | Schwarz criterion | -2.898466 |
| Log likelihood | 93.35343 | Hannan-Quinn criter. | -3.638045 |
| Durbin-Watson stat | 2.996239 | | |

**Source:** Author's regression output

From the ECM Regression results in table 3 above, Monetary policy rate (MPR) has a negative and significant relationship at 5% level of significance with Gross Domestic Product (GDP) at

lag 1, 2, 3 and 4. Since the relationship is significant, we reject the null hypothesis $Ho_1$. Also in Hypothesis $H0_2$ Cash Reserve Ratio (CRR) has a positive and significant relationship at 5% level of significance with Gross Domestic Product (GDP) at lag 1 and 4. Since the relationship is significant, we reject the null hypothesis $Ho_2$

Furthermore, in $^{Ho}{}_{3}{}'$ Liquidity Ratio (LQR) has an insignificant relationship with Gross Domestic Product (GDP) at all levels. Since the relationship is insignificant, we accept the null hypothesis $Ho_3$. While, Treasury Bill Rate (TBR) has a positive and significant relationship at 5% level of significance with Gross Domestic Product (GDP) at lag 1, 3 and 4. Since the relationship is significant, we reject the null hypothesis $Ho_4$. Also the result in table 4.3 reveals that the error correction term is negative and statistically significant and this corroborates and shows evidence of a certain return to the short run equilibrium in the model. The negative value shows that there exists an adjustment speed from short-run disequilibrium towards the long-run equilibrium.

The coefficient of determination ($R^2$) shows that the independent variables explains about 97% of total variation in the dependent variable (GDP). Meanwhile the serial correlation test in table 4.4 reveals that there is no problem of serial correlation.

**Table 4:** Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 3.345218 | Prob. F(2,2) | 0.2301 |
| Obs*R-squared | 26.17531 | Prob. Chi-Square(2) | 0.0000 |

**Source:** Author's regression output

**Discussion of Findings**

From the results estimated above in Table 3, Cash reserve ratio (CRR) and Treasury Bill Rate (TBR) were positive and statistically significant, monetary policy rate has a negative and statistically significant to economic growth. While liquidity ratio has a negative and insignificant relationship with economic growth. The implication of the results is that among the monetary policy variables reassessed, it was only monetary policy rate (MPR), Cash reserve ratio (CRR) and Treasury Bill Rate (TBR) that was significant in impacting on economic growth. This showed that as monetary authorities increase the Cash reserve ratio of financial institutions the more effective the money supply will improve economic growth in the Nigerian economy. Finding is in consonance with study of (Anowor & Okorie, 2016) which result revealed that a rise in Cash Reserve Ratio (CRR) leads to higher growth for the Nigerian economy, because it leads to higher economic growth. The Error correction mechanism of the error correction model was negative and statistically significant, implying that a long run relationship exists among the variables. It also showed that if there is short run disequilibrium in economy, in the long run the economy can return to equilibrium with a speed of adjustment.

## Summary of Findings, Conclusion and Recommendations

### Summary of Findings

This research work sought to determine the effect of monetary policy on Economic growth in Nigeria.

The findings from our data analysis revealed and confirmed the following:

1. There is a short run relationship between monetary policy variables and economic growth under the period covered.
2. The Cash Reserve Ratio as one of the monetary policy instruments showed a unit rise lead to an increase in the economic growth in Nigeria.

The finding is in line with (Efanga, Hanson & Umoh, 2020) that result showed that a unit increase in Cash Reserve Ratio (CRR) led to approximately unit increase in economic growth in Nigeria.

### Conclusion

The researcher has been able to examine the effect of monetary policy on economic growth in Nigeria. Following the behavioural pattern of the variables, the researcher adopted Autoregressive Distributed Lagged (ARDL) Bound cointegration test ECM and Serial Correlation LM Test in the study. The study shows that monetary policies like MPR, CRR, and TBR are statistically significant to economic growth in Nigeria. While that of LQR shows an insignificant relationship with economic growth. Which also corroborates the work of (Bernite and Benson, 2018) which revealed that monetary policy has a significant effect on economic growth in Nigeria.

### Recommendations

In the light of the findings of this study, the following recommendations are considered necessary for short-, medium- and long-term implementations.

1. To fasten up the rate of growth of the Nigerian economy, the government needs to initiate and push forward effective and efficient monetary policy measures via Monetary Policy Rate (MPR), Cash Reserve Ratio (CRR), Liquidity Ratio (LQR) and Treasury Bills Rate (TBR) etc.
2. The study recommends that monetary authorities should give priority attention to Liquidity Ratio as it will produce a more desired result in terms of economic stabilization.
3. The study also recommends that there is the need for the Central Bank of Nigeria (CBN) to embark on a comprehensive monitoring of monetary policy instruments and aggregates and place less emphasis on monetary policy rate (MPR) alone. It is important to combine other instruments which the central bank can control effectively like the Cash Reserve Ratio (CRR) and Treasury Bills Rate (TBR) as it is more effective.
4. Finally, It is therefore prudent that in seeking to promote economic growth, Nigeria's banks should be committed to the mission of price stability, as well as improving the regulatory and supervisory frameworks to secure a strong financial sector for efficient intermediation.

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# Energy Consumption and Life Expectancy in Nigeria

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**Abstract**

This study examined the effect of energy consumption (decomposed into renewable and non-renewable energy) on life expectancy in Nigeria from 1981 to 2022. The data for the study is sourced from Central Bank Statistical Bulletin. Energy consumption is proxied by Alternative and Nuclear Energy (ANE), Per Capita Electricity Consumption (CPN) and Fossil Fuel Energy Consumption (FEN), while Life expectancy is proxied by life expectancy at birth. The variables were subjected to stationarity tests and the result shows that the variables were integrated of mixed order of integration (level i(0) & first difference i(1)). This justified the adoption of the Autoregressive Distributed Lag (ARDL) as technique of analysis. The ARDL Bounds test result indicates that long-run relationship exist among the variables in the model. The long result showed that Per Capita Electricity Consumption (EPN) and Per Capita Income (PCI) have positive effect on life expectancy, while Fossil Fuel Energy, Trade Openness, and Alternative and Nuclear Energy (ANE) have negative effect on Life Expectancy in Nigeria. The short run result also shows that per capita electricity consumption has positive effect on life expectancy, while fossil fuel energy consumption and trade openness have negative effect on life expectancy in Nigeria. The study concludes per capital electricity consumption affects life expectancy positively, while fossil fuel energy consumption and alternative and nuclear energy affect life expectancy negatively in Nigeria. This study therefore recommends the adoption of green energy consumption as to improve life expectancy in Nigeria,

**Keywords:** *Energy Consumption, Life expectancy, Renewable and Non-renewable energy*

**Background to the Study**

The quest for economic growth and the need to meet the consumption demand of the teeming population lead to increasing demand for energy. Consumption of energy especially fossil fuel is the primary source of carbon (iv) oxide emission responsible for climate change worldwide and, Nigeria has been acknowledged as one of the main producers and consumers of fossil fuel (Alege, Oye & Adu, 2017). Without mincing words energy consumption especially fossil fuel consumption worsens environmental quality and creates serious harm to people's health and affect aquatic life adversely. The consequence of this is the degradation of the environment, and this has implication for budgetary allocation in terms of health care financing (Balan, 2016).

The continuous consumption of energy regrettably posse a continuous threat to the environment and human life as a result of environmental degradation leading to decline in life expectancy at birth. To guarantee healthy lives and general well-being for all, the United Nations Sustainable Development Goal (SDG3) number three emphasizes good health and well-being of citizens in developing economies by 2030. The Nigeria experience shows the citizens' welfare has been on the decline in the last few decades especially those in the Niger Delta region, given the high rate of pipeline vandalization, and the operation of illegal refinery that gave rise to black soot. This act (illegal refineries operation) increases the rate of respiratory tract diseases with its attendant consequences on the health of the poor.

WHO (2020) opined that the top 10 causes of death in Nigeria in 2019 are mental disorders, accounting for 12.25% of deaths; malaria, 12.2%; diarrhea, 11.36%; respiratory infections, 10.85%; HIV/AIDS, 5.18%; ischemic heart disease, 4.37%; stroke, 3.98%; congenital birth defects, 3.26%; tuberculosis, 2.84%; and meningitis, 2.82%. The sum of these ailments alone accounted for almost 69% of Nigerian deaths in 2019. In 2021, life expectancy at birth in Nigeria is 59 years for males and 63 years for females. Nigeria has one of the highest tuberculosis burdens in the world (311 per 1000), resulting in the largest burden in Africa (UNCED, 2018). These health-related challenges are attributed to the unsustainable use of energy resources in Nigeria.

Although there has been an array of empirical literature relating to the effect of energy consumption on health outcomes with varying degrees of impact, For instance, the empirical studies of Afolayan and Aderemi (2019), Urhie, Afolabi, Matthew, Osabohien and Ewetan (2020), Musa and Maijama (2020), Maji and Adamu (2021) and Oyedele (2022) shows that energy consumption has a positive effect on health outcomes, while the work of Osakede and Sanusi (2018), Matthew, Osabohien and Fasina, (2018) and Rahman and Alam (2022) indicates that health outcomes decrease as energy consumption increases. To these ends, there is no consensus of opinion among scholars on the influence of energy consumption on health outcomes, and to fill that research gap, this study investigates the effect of energy consumption on life expectancy in Nigeria. The question begging for answer is, does energy consumptions disaggregated into renewable and non-renewable energy consumption has any effect on life expectancy in Nigeria? This study is divided six subsections; introduction in section one, followed by literature review in section two. Section three is the methodology, followed by

data analysis and discussion of findings in section four and conclusion and recommendations in section five.

## Literature Review

### Theoretical Literature

### Pollution Haven Theory

Copeland and Taylor proposed the Pollution Haven Hypothesis (PHH) in 1994. The pollution haven theory stated that major industrialized countries seek to establish factories or offices abroad, due to profit motive. However, doing so frequently results in actions that are harmful to the environment. Due to this, businesses primarily relocate abroad frequently to nations with lax environmental regulations or inadequate enforcement. PHH emphasizes that pollution costs influence the margins, where they have some influence on trade flows and investment decisions. Costs associated with pollution control are significant enough to have an impact on commerce and investment. To entice investment or boost exports, nations lower their environmental standards below those that would maximize societal efficiency.

The empirical support to the PHH is mixed as (Jaffe et al., 1995; Tobey, 1990) did not find any evidence to claim that stringency of environmental regulation of a country had any impact on the trade of pollution-intensive goods. On the other hand, Mani and Wheeler (1998**),** found temporary evidence in favour of the PHH. Cole (2004) also found that pollution intensive industries grew at rapid speed in developing countries in the periods when environmental regulations in OECD countries had been very stringent. Similarly, Frankel and Rose (2005) also found a support for the PHH from a city-level study of SO2 concentrations and Cole and Elliott (2005) also supported these results.

Nevertheless, Dinda (2004), rejected the PHH stance. He submitted that the polluting industries that tend to locate in the developing countries would also raise the income levels of the host country. Resultantly, these host countries would also start imposing the stringent environmental regulations. Therefore, sooner or later there would be no country where polluting industries can be relocated, and all countries would be on same playing level.

The criticism against the PHH is; thus, first, it is argued that firms while shifting to a country that has lax environmental regulations also consider that pollution reduces the productivity of the labour force that may raise the labour cost of the firm. Second, the firms also consider the huge sunk cost when they decide to shift the production operation to another country. Third, the countries with lax environmental regulations usually have a weak legal system and ill-defined commercial laws. Whereas the investors from developed countries prefer the countries that have clear regulations and effective enforcement of laws. Therefore, they are likely to avoid investing in those countries that have lax environmental regulations (Ethier, 1982; Helpman, 1984; Markusen, 1984). From the PHH stand point, the stringent environmental regulations in developed countries lead to relocation of the polluting industries from developed to developing countries and cause pollution to rise in developing countries. While on the other hand, PH holds that, stringent environment regulations prompt advanced technologies and innovations that reduce relocation of the industries, improve the

competitiveness of the industries, and thus improve the environment. The empirical studies reveal that environmental regulations play a different role in different perspective.

The relevance of the PHH to the current study is that multinational corporation (MNC) trade and investment have a disrupting health outcome due to the impact of pollution (transfer of dirty goods) on the environment in the developing countries. For example, as more dirty firms migrate to country with lax environmental control or regulations, there are likelihood FDI inflow is guaranteed but overtime the activities of the MNC tends to create pollutant that pollute the environment which in turn causes health hazards. It is upon this basis that PHH is imperative to underscore the nexus between energy consumption and health outcome. This is also because, MNC requires fossil fuel energy to power their plants which causes gas flaring and thus disrupts the ecosystem and the sustainable environmental condition of the place where production activities had occurred. The Niger Delta of Nigeria is a classic example of the long-run implication of PHH migration to areas with lax environmental control. Overtime there has been massive environmental degradation, decline in biodiversity, and high mortality occasioned by disrupting pollution. Thus, as the scale of production of the MNCs increase there is high tendencies that life expectancy would decline.

**Empirical Literature**

**Energy Consumption and Life Expectancy**

Oyedele (2022), examined the health consequences of environmental quality due to carbon dioxide emission in Nigeria for the period 1980 to 2016. Using two health outcome measures and decomposing carbon dioxide emission by sector and type of fuel consumed a bound co-integration approach and an autoregressive distributed lag model were also employed. The results and a sensitivity analysis revealed that aggregate carbon dioxide emission significantly explained both infant mortality and under five mortality rates. However, when disaggregated, carbon dioxide emission from solid fuel had the greatest contribution to poor health outcomes.

Rahman and Alam (2022), examined the effects of globalization, energy consumption and information communication technology on health status in Australia: the role of financial development and education using the data period of 1990–2018, a series of econometric techniques: the Dickey-Fuller test, Autoregressive Distributive Lag bounds test, fully modified ordinary least square method and the pairwise Granger causality test, are applied. The findings disclosed that globalization, renewable energy use, information and communication technology, per capita gross domestic product, education rate, and financial development increased during this period, but non-renewable energy use reduced life expectancy at birth. Unidirectional causal associations of the studied variables with life expectancy at birth are also revealed. The study concluded that the effective, efficient, and inclusive policies considering globalization, renewable and non-renewable energy consumption, information and communication technology, financial development, education rate, and economic growth should be formulated and executed for guaranteeing health status.

Gershon and Emekalam (2021), empirically analyzed the determinants of Nigeria's renewable energy consumption between 1990 and 2014, a period of twenty-four years using Toda- Yamamoto method. Long-run relationship exists between renewable energy consumption and its determinants in Nigeria. Real income (real GDP) and emissions of CO2 are the most significant determinants of oil products import demand in Nigeria. Trade Openness was found to be insignificant. The analysis showed no causality between the consumption of renewable energy and some of its determinants. However, unidirectional causality runs from CO2 emission to GDP which implies that fossil fuels are significant drivers of real GDP or economic growth for Nigeria. It is evidenced that environmental considerations are less critical than real income to the consumption and development of renewable energy in Nigeria.

Maji and Adamu (2021), examine the impact of renewable energy consumption on sectoral environmental quality in the presence of government effectiveness in Nigeria. A regression analysis was used to estimate a dataset for the period of 1989–2019. Sectoral environmental quality indicators and sectoral output were considered from the agricultural sector, manufacturing and construction sector, transportation sector, oil sector, residential buildings and commercial and public services sector, other sectors and per capita indicator. The result shows that renewable energy consumption does not have a favourable impact on the environmental quality of the agricultural sector, manufacturing and construction sector and oil sector. However, renewable energy consumption has a favourable impact on the environmental quality of the transportation sector, residential buildings, commercial and public services sector. Nevertheless, renewable energy consumption has a neutral impact on the environmental quality of other sectors. Policy implications were drawn after considering the expected value of sectoral environmental quality indicators with significant elasticities.

Urhie et al., (2020), examined economic growth, air pollution and health outcomes in Nigeria: A moderated mediation model. The third of the sustainable development goals is to ensure healthy living and promote well-being for all by 2030. The Nigerian government has made several efforts at achieving this goal. Economic experts have projected that the Nigerian economy must grow at a minimum rate of 6–8% yearly to catch up with global development and contribute positively to goals set by nations of the world. However, the attainment of high levels of economic growth could have implications for the attainment of other development objectives in the economy. One of such implications is pollution of the environment caused through productive activities. In carrying out productive activities, a cycle from production to consumption occurs to affect the release of emissions into the atmosphere and environment which in turn hampers health stability. In order to assess the cyclical effects of these economic relationships, this study adopted the use of a moderated mediation model. The model helped in the explanation of interactions among economic growth, air pollution and health performance. The interactions were analyzed with process macro, an analytical tool developed by Hayes. The study found air pollution and government expenditure on health as a significant interaction that affects health performance in Nigeria. Consequently, efforts by the government to ensure environmentally friendly production and consumption will minimize air pollution and prevent adverse health outcomes. Manufacturing firms that emit poisonous gases into the air should be sanctioned. This will serve as a deterrent to others.

Musa and Maijama (2020), investigated the influence of economic growth and energy consumption on environmental pollution in Nigeria for over 1981-2014 periods and utilized Augmented Dickey Fuller (ADF) and Philip Perron (PP) unit root tests together with Autoregressive Distributed Lag (ARDL) Model in the process of achieving the desire objective. The outcome revealed that all the variables were stationary at first difference and cointegrated whereas the long-run outcome revealed that economic growth and energy consumption have significant positive effects on environmental pollution and this implies that increasing economic growth and energy consumption are responsible for the increasing level of environmental pollution while crude oil price has negative and significant influence on environmental pollution which implies that crude oil price reduces environmental pollution in the long-run. All the short-run outcomes corroborate their long-run counterparts. Nigeria government should emphasis more on the consumption of renewable energy in order to lessen the damaging impacts of economic activities and fossil fuels energy consumption on the quality of the country's environment.

Yahaya, (2019), examines the relationships between energy consumption, financial development, GDP, urbanization, and environmental pollution in Nigeria from the period 1980- 2011 by applying autoregressive distributed lag (ARDL) method. The finding shows that in the short-run energy use is positively related with environmental pollution, while financial development and GDP reduce environmental pollution. The long-run analysis shows that energy consumption is positive and significant in influencing environmental pollution. The results suggest that Nigerian policymakers should formulate efficient policies, such as adoption of low emissions technology in Nigeria to achieve a clean environment.

Wang, Yin and Zeng (2019) examined how the widespread adoption of natural gas as a source of clean energy improves the health of pregnant women: Using variation across provinces and over time in the density of natural gas infrastructure in China, the result identified a significant and negative clean energy adoption – maternal mortality relationship in China. The time series data covered 2000-2014. Specifically, it was shown that a one-unit increase in natural gas density measured by the length of natural gas pipelines per 10,000 persons caused the maternal mortality rate to decrease by 4%, which translated into an annual gain of approximately 648 pregnant women's lives. The finding suggests that natural gas adoption has substantial health externalities and should be an important part of policy discussions surrounding clean energy production.

Afolayan and Aderemi (2019), empirically examined the relationship between environmental quality (proxied by carbon dioxide, CO2) and health effect; and its implications for achieving sustainable economic development in Nigeria from 1980 to 2016. DOS and causality test were employed that CO2 emissions and mortality rate are negatively but insignificantly related. However, total electric power consumption and mortality rate have a positive relationship which is significant at 5% level. Also, Fossil fuel combustion and mortality rate have a significant positive relationship. From the causality test; the study found a unidirectional causality which runs from CO2 emission to electric power consumption is observed, CO2 emission granger causes government health expenditure, life expectancy granger causes

electric power consumption and fossil fuel consumption granger causes mortality rate, and a unidirectional causal relationship flowing from life expectancy and mortality rate to government health expenditure.

**Research Design**

Research design means the template for data collections in the form of experimental and quasi-experimental design. This study will adopt a quasi-experimental research design since it is the most suitable research design for social sciences. The quasi-experimental research design will enable the researcher to determine the cause-and-effect relationship between dependent and independent variables and does not rely on random assignment of data.

**Model Specification**

The baseline study for this paper is built on Suleiman and Abdul-Rahim (2018) model. The study captured the impact of population growth and economic growth on environmental quality. Suleiman and Abdul-Rahim (2018) estimated the effect of population and economic growth on carbon dioxide emission (proxy as CO2) in Nigeria using a recursive ordering model given in equation 1 such as;

$$CO2_t = \beta_1 + \beta_2 Y_t + \beta_3 EC_t + \beta_4 PG_t + \mu_t \quad 1$$

Where:
C02t = Carbon dioxide emission per capita
Yt= Real GDP per-capita
ECt= Energy consumption per capita
PGt= Population growth rate
μt= Stand for random term/disturbance

This foregoing baseline study showed a functional relationship between CO2 emissions and energy consumption and growth. The paper did not consider the impact of energy consumption on health outcomes in Nigeria. Given, the imperative of policy shift towards energy mix it is apt to therefore deepens the literature's concern on the nexus between energy consumption and health in Nigeria. In this study, energy consumption is decomposed into renewable energy and non-renewable energy. Therefore, life expectancy (LEX) is proxied by life expectancy at birth.

Model Specification
LEX = f (ANE, EPN, FEN, PCI, TOP) 2

The econometrics form of the equation is expressed as follows:
$LEX_= \beta_0 + \beta_1 ANE + \beta_2 EPN + \beta_3 FEN + \beta_4 PCI + \beta_5 TOP + \mu$ 3

Where:
LEX = Life expectancy
ANE = Alternative and nuclear energy use

EPN = Electric power consumption
FEN = Fossil fuel energy consumption
PCI = Per Capita Income - Controlled variable
TOP =Trade openness – Controlled variable
A priori $\beta 1, \beta 4, \beta 5 > < 0$ while $\beta 2, \beta 3 < 0$

**Data Analyses & Interpretation**
**Descriptive Statistics**
**Table 1:** Descriptive Statistics: Life Expectancy Model (LEX)

| | LEX | ANE | EPN | FEN | PCI | TOP |
|---|---|---|---|---|---|---|
| Mean | 48.57507 | 0.374938 | 108.7436 | 19.47865 | 1798.366 | 46.98951 |
| Median | 46.51000 | 0.350200 | 100.8853 | 18.95003 | 1607.000 | 48.45000 |
| Maximum | 54.68700 | 0.561356 | 156.7972 | 22.84479 | 2564.000 | 81.81000 |
| Minimum | 45.63700 | 0.274464 | 50.90104 | 15.85414 | 1324.000 | 21.12000 |
| Std. Dev. | 3.235404 | 0.079401 | 29.84129 | 1.549048 | 446.8618 | 18.33401 |
| Skewness | 0.745887 | 0.675946 | 0.117544 | 0.327402 | 0.447819 | -0.003192 |
| Kurtosis | 1.939505 | 2.732707 | 1.675576 | 2.688815 | 1.555531 | 1.727264 |
| Jarque-Bera | 5.722983 | 3.244220 | 3.091001 | 0.897905 | 4.934790 | 2.767326 |
| Probability | 0.057183 | 0.197482 | 0.213205 | 0.638296 | 0.084805 | 0.250659 |
| Sum | 1991.578 | 15.37248 | 4458.488 | 798.6247 | 73733.00 | 1926.570 |
| Sum Sq. Dev. | 418.7136 | 0.252180 | 35620.09 | 95.98201 | 7987420. | 13445.43 |
| Observations | 41 | 41 | 41 | 41 | 41 | 41 |

**Source**: Authors compilation

From the descriptive result in Table 1, the result shows that the mean value, which is the average of the distribution between 1981 and 2021 for LEX, ANE, EPN, FEN, PCI, and TOP is 48.57507, 0.374938, 108.7436, 19.47865, 1798.366, and 46.98951, while the median value is 46.51000, 0.350200, 100.8853, 18.95003, 1607.000, 48.45000 and 17.89500. Relatively, all the series have the capability to withstand external aggression since their median values are close to their mean. The maximum and minimum values for the distributions are: 54.68700, 0.561356, 156.7972, 22.84479, 2564.000, 81.81000 and 19.40800 and 45.63700, 0.274464, 50.90104, 15.85414, 1324000, 21.12000 and 11.63000 respectively. The measure of dispersion or spread in the series is gauged by standard deviation as 3.235404, 0.079401, 29.84129, 1.549048, 446.8618, and 18.33401 for LEX, ANE, EPN, FEN, PCI, and TOP respectively. This shows how the series deviates from the mean. The skewness statistics shows that LEX, ANE, EPN, FEN and PCI have a long right tail, while TOP has a long-left tail. The Kurtosis which measures the peakness of the distribution indicates that LEX, EPN, PCI, and TOP have a flat and plytokurtic disposition, while ANE and FEN present a mesokurtic disposition, relative to normal. Finally, the Jacque-Bera statistics and the associated probability values of the variables indicate that the residual follows a normal distribution because their probability values are greater than the 5% statistically significant level.

**Unit Root Test**

The unit root test for the stationarity condition of the series was performed using the Augmented Dickey-Fuller (ADF). Test statistics are extracted and presented in Table 2.

**Table 2:** Unit Root Result

| Variables | At Level, T-stat @5% | | First Differencing | | |
|---|---|---|---|---|---|
| Constant And Trend | Critical value | | T-stat @5 %, Critical value | | Order |
| LOG(LEX) | -3.3006761 | -3.527759 | -6.321356 | -3.529758 | I(1) |
| ANE | -3.945138 | -3.526609 | - | - | I(0) |
| LOG(EPN) | -3.686895 | -3.526609 | - | - | I(0) |
| FEN | -3.235413 | -3.526609 | -6.471925 | -3.529758 | I(1) |
| LOG(PCI) | -1.569833 | -3.533083 | -3.713407 | -3.533083 | I(1) |
| TOP | -1.920088 | -3.526609 | -4.071247 | -3.552973 | I(1) |

**Source**: Authors compilation

Evidence from the stationarity test table 2 conducted with a unit root procedure proposed by Augmented Dickey Fuller (ADF) indicated that the variables have a mixed order of integration. Majority of the variables in the model attained stationarity after first difference in line with the proposition of Box and Jenkins (1976). Box and Jenkins (1976) argued that a non-stationary series will be made stationary after first differencing, while LITR was mean-reverting. Mean reverting in this context implies that literacy rate was stationary at level. This justifies the application of autoregressive distributed lag (ARDL) model as was proposed by Pesaran, Shin and Smith (2001.

**Co-integration Test**

**Table 3:** Bound Co-integration Test LEX Model

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| F-statistic | 6.477874 | 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 from Eviews 9

Table 3 indicate the Bounds Co-integration test in estimating Energy Consumption and life expectancy in Nigeria using time series data spanning 1981-2021 sourced from CBN Statistical bulletin for the various years. It can be inferred from the output above that the F-Stat value of 6.477874 is greater than the upper bound critical value of 3.38 at 5% evidenced by the presence of a long-run co-integrating relationship among the series in the model. Hence, the Null Hypothesis of no level relationship or no co-integration is rejected; and the Alternative

Hypothesis is accepted. The researcher, therefore, proceeds to estimate the long-run and short run coefficients since there is co-integration among the series.

**Long Run ARDL Result**

**Table 4:** ARDL Long Run Result LEX

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| ANE | -0.078698 | 0.087949 | -0.894808 | 0.3842 |
| LOG(EPN) | 0.198158 | 0.075826 | 2.615798 | 0.0234 |
| FEN | -0.013931 | 0.004188 | -3.326489 | 0.0043 |
| LOG(PCI) | 0.357695 | 0.101635 | 3.519420 | 0.0028 |
| TOP | -0.000724 | 0.000312 | -2.319870 | 0.0339 |
| C | 2.288824 | 0.421847 | 5.425722 | 0.0001 |

**Source:** Authors compilation

Evidence from Table 4 shows that Electric Power Energy Consumption (EPN) and Fossil Fuel Energy have a negative effect on Life Expectancy in Nigeria and are statistically significant at 5%. Ceteris paribus, a unit increase in EPN and FEN will reduce life expectancy by 15.8% and 1.4% respectively. These results are in consonant with a priori expectation and align with the work of University of Leeds (2020) which opined that countries could improve their citizens' lives without requiring more energy consumption.

In the long run result from table 4, Per Capita Income is positively related to Life Expectancy and it is statistically significant at 5%. All things being equal, a unit increase in PCI will increase life expectancy by 35.8%. This is in line with theory; Per capita Income is expected to increase life expectancy at birth through increasing economic growth and development in a country which leads to longevity. This result supports the position of Miladinov (2020).

Evidence from table 4 finally showed that Trade Openness has a negative relationship with Life Expectancy and it is statistically significant at 5%. This contradicts a priori expectation and did not agree with the work of Byaro et al., (2021). However the reduction in LEX as a result of one unit increase in TOP is infinitesimal.

**ARDL Short Run Result for Model one (LEX)**

**Table 5:** ARDL Short Run Result for LEX Model

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(LEX(-1)) | 0.020146 | 0.113951 | 0.176794 | 0.8619 |
| DLOG(LEX(-2)) | 3.448252 | 0.372374 | 9.260189 | 0.0000 |
| DLOG(LEX(-3)) | -2.762532 | 0.322235 | -8.573041 | 0.0000 |
| D(ANE) | -0.022851 | 0.006157 | -3.711452 | 0.0019 |
| DLOG(EPN) | 0.005936 | 0.003262 | 1.819918 | 0.0875 |
| DLOG(EPN(-1)) | 0.019121 | 0.003121 | 6.127415 | 0.0000 |
| DLOG(EPN(-2)) | 0.014957 | 0.002668 | 5.605129 | 0.0000 |
| DLOG(EPN(-3)) | 0.013005 | 0.002418 | 5.377952 | 0.0001 |
| D(FEN) | -0.000656 | 0.000235 | -2.784664 | 0.0133 |
| D(FEN(-1)) | -0.000768 | 0.000214 | -3.591438 | 0.0024 |
| DLOG(PCI) | 0.032374 | 0.008233 | 3.932049 | 0.0012 |
| D(TOP) | -5.26E-07 | 2.28E-05 | -0.023087 | 0.9819 |
| D(TOP(-1)) | 0.000118 | 2.83E-05 | 4.147555 | 0.0008 |
| D(TOP(-2)) | 6.44E-05 | 2.42E-05 | 2.657513 | 0.0172 |
| ECM (-1) | -0.123451 | 0.015634 | -7.896172 | 0.0000 |
| R-squared | 0.855769 | Mean dependent var | | 0.004496 |
| Adjusted R-squared | 0.727622 | S.D. dependent var | | 0.004879 |
| S.E. of regression | 0.001313 | Akaike info criterion | | -10.14282 |
| Sum squared resid | 3.79E-05 | Schwarz criterion | | -9.489741 |
| Log likelihood | 202.6421 | Hannan-Quinn criter. | | -9.912576 |
| Durbin-Watson stat | 2.303014 | | | |

**Source:** Authors compilation

Table 5 illustrates the short-run (SR) results and the Error Correction Mechanism. The $R^2$ valued at 85% shows the model has a good fit, while the adjusted $R^2$ valued at 72% indicates that the 72% variation in CEM is accounted for by the explanatory variables in the model, while the remaining 28% is exogenously determined by variables outside the model or captured in the error term. The Durbin-Watson statistics valued at 2.303014 indicate the absence of first-order autocorrelation in the model, while the log likelihood of 202.6421 shows that the entire model has a good fit and will be sustainable over time. The ECM term appears with a normal sign (-) and it is statistically significant at 5% (P-value). Therefore, the past disequilibrium will be adjusted at the speed of 12% annually, meaning that disequilibrium in the previous year's caused by variables in the model can be corrected in the present year to equilibrium at the speed of 12%.

In the short run, the coefficient of ANE, FEN, and PCI have a negative effect on Life Expectancy and it is statistically significant at 5%. A unit increase in ANE, FEN, and PCI will reduce Life Expectancy by 0.022851, 0.000656 and 0.032374 respectively. FEN conforms to a priori expectation. Increase in energy consumption (non-renewable) will generate more carbon dioxide which reduces life expectancy. But its past realization DFEN(-1) is positively related and statistically significant; meaning that an increase in FEN, will increase LEX by

(0.000768), this does not conform to theory. However, ANE defied apriori expectation in that it is expected that increase in alternative nuclear energy (renewable) will help to increase life expectancy. In like manner, PCI also defied aprori, this is because Per capita Income is expected to increase life expectancy at birth through increasing economic growth and development in a country which leads to longevity. This contradicts the position of Miladinov (2020). Evidence from the short-run result from table 4a shows that the past realization of Dlog(LEX(-2) has a positive relationship on itself and it is statistically significant at 5 percent. The meaning of the result is that a unit increases in the past value of LEX increase life expectancy and therefore spurs effective aggregate demand which in turn increase demand for energy. The positive impact of LEX therefore stimulates economic growth in general.

Also in the short run, the past realization of DEPN(-1), DEPN(-2), DTOP(-1) and TOP(-2) have a positive relationship with life expectancy and are statistically significant. However, EPN's positive relationship does not conform to theory but defies apriori expectation; energy consumption is expected to reduce life expectancy. TOP on the other hand is in consonant with the theory. TOP is supposed to boost the economy and increase LEX. This agrees with the work of Byaro et al., (2021).

**Table 6:** Post Estimation Test for LEX Model

| S/N | TEST | F-STATISTICS | P-VALUE |
|---|---|---|---|
| 1 | Normality Test (J-B) | 0.730198 | 0.694128 |
| 2 | Serial Correlation | 1.155139 | 0.3002 |
| 3 | Heteroskadasticity | 4.995296 | 0.1010 |
| 4 | Ramsey L-M Test | 0.742238 | 0.4025 |

Author's Compilation

Information from the diagnostic checking shows that the residual of the model is normally distributed, given the probability value of (0.694128) of the bell-shaped histogram and the associated Jarque-Bera value of (0.730198). There is no presence of serial correlation and Heteroskedasticity in the residual, given that their probability values are above 5%. Finally, the CUSUM test proposed by Brown et al. (1975) is applied to confirm that the model has satisfied the stability test. Figure 4 below indicates that the model is within the critical bounds.

**Conclusion**

The study investigated the effect of energy consumption on life expectancy on Nigeria from 1981 to 2021. The study used renewable and non-renewable energy to proxy energy consumption as the independent variables while life expectancy is the dependent variable. Per Capita Income and Trade openness were used as check variables. Descriptive statistics, unit root test, bound cointegration test as well as Autoregressive distributed lag (ARDL) were employed to analyze the data. The study reveals that in the long-run Electric Power Energy Consumption (EPN) and Fossil Fuel Energy have a negative effect on Life Expectancy in Nigeria and are statistically significant at 5%. Ceteris paribus, a unit increase in EPN and FEN will reduce life expectancy by 15.8% and 1.4% respectively. Per Capita Income (PCI) is positively related to Life Expectancy, and it is statistically significant at 5%. Also, the result

showed that trade openness has a negative relationship with Life Expectancy and it is statistically significant at 5%. The study concludes that energy consumption has time-varying impact on life expectancy in Nigeria within the period under review.

In view of the findings from the study, the following recommendations are advanced for consideration:

1. Government should pursue policy that will cause gradual policy shift from CO2 emissions generating energy systems to green solutions system that can support local productivity without disrupting value chain in the country.
2. Government should levy environmental tax on multinational companies to reduce the rate of carbon (iv) oxide emission.

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# Agricultural Activities and its Implication for Agric-Tourism Development in Ebo Farm Site in Yala Local Government Area, Cross River State

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**Abstract**

Agric-tourism is an important potential area to substitute national revenue generation considering the important need for new forms of physical and social economic development tools in Nigeria. It is a common knowledge that in the 1960s and 1970s Nigeria was tagged as a country with substantial agricultural economy. This period experience tremendous progress in economy of the nation. Sad to say, presently the growth of the agricultural sector has continued to decline over the years as a result of over dependence on petroleum products. A critical look into the agricultural activities and it's for agric-tourism in Ebo community in Yala Local Government Area of Cross River State, Nigeria will be an eye opener to many and to the Government (Local, State and Federal) level. The objective of the studies is to examine agricultural activity in Ebo Farm Site for agric-tourism development in Yala Local Government Area Cross State, Nigeria. Ethnographic method was adopted during this research processes, Information were collected through various data gathering techniques like semi structured interview and open discussions which was used as a primary research tool, in order to obtain villagers opinion on agric- tourism as well as agricultural activities in the locality. The result revealed that practice of farming activities, such as crop production, snail farming, fish production and dairy within the Ebo people will offer lasting experience and opportunities for the tourists, which will in turn generate revenue and increase the livelihood of the people.

**Keywords:** *Agricultural activities, Agric-tourism, Ebo farms site, Development*

**Background to the Study**

Agric-tourism is any commercial enterprise that combines agriculture and tourism on a working farm, ranch, or other agribusiness operation. The Commonwealth of Kentucky (2011) defines agric-tourism as the act of visiting a working farm or any agricultural, horticultural, or agribusiness operations for the purpose of pleasure, education or active involvement in the activities of the farm or operation. Furthermore, Agric-tourism is a rapidly emerging form of tourism in Europe and America due to the urgency of preventing the risk of low agricultural participation which could affect the economy of concerned countries (Kukorelli, 2011). Thus, promotion of agricultural activities through tourism is becoming a strong medium of encouraging participation in agriculture globally.

Sadly, in Nigeria enough attention has not been given this area to attract the large population of the teaming unemployed youth to agriculture. The Nigeria's economy is majorly based on crude oil. It accounts for 95% of Nigeria's foreign exchange earnings (Uwakonye, 2006). Nigeria is at the risk of severe economic trauma if the petroleum sector fails to prosper. Thus, agric-tourism is also a vital potential area to substitute national income generation considering the prime need for new forms of physical and social economic development tools in Nigeria. It is a common knowledge that in the 1960s and 1970s Nigeria was tagged as a country with substantial agricultural economy. This period experiences tremendous progress in economy of the nation. Sad to say, presently the growth of the agricultural sector has continued to decline over the years as a result of over dependence on petroleum products. A critical look into agricultural activities in Ebo community in Yala Local Government Area of Cross River State, Nigeria will be an eye opener to many and to the Government (Local, State and Federal) level.

**Research Objective**

To examine the agricultural activity in Ebo Farm Site for agric-tourism development in Yala Local Government Area Cross State, Nigeria.

**Research Methodology**

The research method for this study was ethnographic in nature. Information were collected through various data gathering techniques like semi structured interview and open discussions which was used as a primary research tool, in order to obtain villagers opinion on agric tourism as well as the potential of agric tourism in the locality. The research approach utilised comprehensive literature review on the various related topics which were used to guide the research objectives. Finally, this study represents an exploratory approach, which intends to understand the potentials of agric tourism development. Therefore, the data analysis was limited to thematic-subheadings.

**Background information/Study Area**

Woleche Ebo Farm Site is located in Yala Government Area of Cross River State Nigeria. The farm settlement is one of the large expenses in Woleche Ebo community. The topographic nature of the farm settlement made it possible for people (farmers) to carry out agricultural activities on a daily basis. The farm site has so many ecotourism features which are in term

with agric tourism. Amongst the potentials of the Ebo farm site includes the Woleche Ebo river basin, the Ebo monolith site, woleche Ebo rock, the Ebo hill and countless streams surrounding the farm settlement. The farm settlement produces crop like cassava, yam, rice, vegetables, fruits and bush animals like rabbits, grass cutter, monkeys, bush pig and different kinds of birds. The unique nature of the farm settlement has continued to draw neighbouring village dwellers and visitors to the place; hence yams, vegetables, rice, bush meats, fish are in large demand from the host community and outsiders.

**Data Presentation/Findings**

The qualitative data were analysed thematically based on the information obtained during the interview with the farm workers Mr. Daniel Echuku retired civil servant and oil palm harvester Mr. Ogbaji Gabriel. This data was complemented with the field survey.

**Table 1:** Thematic analysis of the interview conducted for the farm managers and workers

| **Variables** | **Responses** |
|---|---|
| Farm activities | **Crop production** : oil palm, cassava, rice, groundnut, yam, maize, pepper, okra, plantain. **Fruits:** pawpaw, cashew, mango, Guava. **Vegetables and herbs:** Green leaf, Moringa (*Moringa oleifera*), Amaranth, African Eggplant (*Vignia unguculata*), Roselle hibiscus. **Animal production:** rearing of poultry for slaughter and breeding, breeding of rabbits, fish production, pig breeding, guinea fowl rearing, foreign turkey rearing, snail cultivation, fish farming, chicken and egg production, as well as goat rearing. |
| Number of workers and their level of education | Over 50 workers<br>Both experienced and<br>Unskilled |
| Would visitors be allowed on farm? | Yes, but on a segmented land different from farmed land due to the bio-security measures |
| Facilities | Rice processing hunt<br>Yam homestead<br>Honey processing centre |
| Infrastructures | Shelter built on farm area<br>Segmented relaxation points under the tree canopies<br>Rural family houses or room for visitors<br>Water supply containers |
| Natural features | River<br>Streams<br>Rock shelters<br>Hills |

**Source:** Field Survey (2022)

The interview shows that the art of farming activities, such as crop production, snail farming, fish production and dairy will offer sustainable experience and favourable circumstance for the tourists. There is an urgent requirement to increase the skill and level of education of the staff encountered during the course of the study to conform with agric-tourism globally practise, owing to the fact that the industry is a relatively a new concept, especially in this part of Nigeria. This is in an accordance with opinion of Kiper (2013) which opined that ecotourism is a somewhat new management techniques and one that need thorogh and well-focused training of staff that are lacking in the field of environmental analysis and education; trail design and maintenance; impact monitoring techniques, including limits of acceptable change; visitor management techniques; communication and human relations skills; accounting; fundraising and public relations; and extension techniques. However, the restriction placed by some farm management not to allow visitors to access their farms due to the bio-insecurity issues is likely to impact influx to the farms negatively. The case of bio-insecurity highlighted can be easily mitigated if the right organisation given the task of ensuring bio-safety in Nigeria is included. Security of bio resources in the country is part of the mandate of the Nigeria Bio- safety management agency. Parry (2005) asserted that a poor numbers of tourists´ part take in on-farms activities is widely due to the restrain of their inability to approached. The responses gather from the informant (the farm workers) were consummate with field experience. It is gear toward at establishing the state of manmade facilities, such as accessibility, relaxation and accommodation (Table 2).

**Table 2** Field observation

| S/N | EBO Farm Site |
|---|---|
| | It was observed that<br>— road accessibility to the farm is in excellent condition;<br>— products, such as eggs, snails, fish, chicken, turkey, are being sold to locals and visitors or neighbouring villagers;<br>— encroachment is low as there are few Buildings around the farm. |

**Plate 1:** the researcher at Ebo River side

It was notice that the access to the farms is in good state and farm products are made available to the residence and outsiders. Encroachment is one of the major factor that will likely affect the expansion in future. Also, the data gathered from the field survey serves as a yardstick for classification of the mentioned on-farm agricultural activities as either available or unavailable (Table 3).

**Table 3**: Classification of the identified potential agric-tourism activities

| **General agric-tourism Classification** | **Agric-tourism Activities** | **EBO farm Site** |
|---|---|---|
| Direct agricultural sales or marketing | Direct on-farm sales<br>Market store | Available |
| Educational tourism/experience | Farm tour<br>Farm work demos | Available |
| On-farm entertainment | Event on Farm (Moonlight stories, folklores etc)<br>Animal rides | Available |
| Hospitality service | Farm made foods/restaurant<br>Farm camping | Available |
| Outdoor recreation | Farm hunting<br>Fishing<br>Bird watching<br>Hiking path | Available |
| Community indigenous knowledge | Pottery making house<br>Wood carving house | Available |

**Plate 2:** (a) the researcher at Ebo Farm site. (b) homestead at the Farm site

According to Walke's (2013) broad categorization, ecotourism and agric-tourism activities in the Ebo community both fall under this category. The requirement for the management of these farms to encourage available agric-tourism activities and to make appropriate provisions for those that are not justified by this classification. For instance, in order for tourists to be able

to eat at the farm-made foods/restaurant, it is necessary to regularly support the production of various food crop varieties. Additionally, this will increase farmer revenue and strengthen the farm's economy. This backs up Kosic's and Rohana's (2015) findings that the expansion of farm-based activities and the provision of goods like food and fruits for the Visitors could help farmers decide how to use agric-tourism strategies to create additional cash to support their farming operations. Since they are easily accessible, it was assumed that the farmers are now engaging in direct agricultural marketing or sales (direct on-farm sales and market outlets). There are additional facilities that support educational tourism and experiences, such as farm tours and agricultural skill demonstrations.

**Plate 3:** The Ebo River

**Discussion**

The findings of the study indicate that the farm site in the Ebo community is still engaged in agricultural production rather than preserving their land just as a tourist attraction for landscaping. While the host community still engages in farming, the emphasis is not on the typical commodity crops connected to production agriculture. Crops including corn, rice, cassava, yams, vegetables, herbs, and fresh fruits are among the produce items grown on the farm. This makes sense, though, given the distinctive and experiential options available in the development of specialty crops, which would be less appealing in the context of the massive monoculture typical of the production of commodity crops. The Ebo Farm Site has some characteristics in common with old-fashioned family farms. Most farms are privately owned and run. Farmers engaged in agricultural activities and are mostly youth and lower average age. The lower average age for the farm workers in this study deserves further exploration, as it may be suggesting either the incorporation of new skills within a younger generation of farmers or the farm diversification to facilitate succession of the business among family members. The lower average age may also be suggesting the entrance of younger people into the farming business and a more entrepreneurial approach to production agriculture.

Results also indicate that farm employees believe agric-tourism will be crucial for achieving a variety of marketing, personal, and social objectives. The most significant objectives that agric-tourism will serve are thought to be educating the host community about agriculture and

improving quality of life for the farm family. It was not surprising that there was a focus on bringing in new clients given the host community's goal in boosting agricultural sales and visitor counts. The study also supports the idea that, as previously proposed, agric-tourism is an effective way to draw tourists to the farm who will then purchase other agricultural products. The value of promoting and supporting agriculture can be shown in how the host community is educated about it and how the farm family's quality of life is improved preserving the rural and agricultural lifestyle for those living on the farm and in the surrounding area.

The pleasant scenery at Ebo Farm, meanwhile, provides visitors a feeling of being near to nature. The farm has a variety of facilities, such as a rice processing arena, a yam shop, a honey processing center, a storage and preservation house, and more. Additionally, the introduction of crop species that are uncommon in this region of the world has made the Ebo farm site unique; the farm features a number of hybrid mango stands, a plantation of plantains, a groundnut farm, etc. The farm's animal farming operations include the raising of chicken (layers and broilers), guinea hens, fish, foreign turkeys, snails, pigs, and more. Additionally, the farmers raise catfish (Clarias batrachus) in roughly 10 fishponds (Samuel, 2022 pers.com).

Another intriguing aspect of the site is the farm's restaurant, which serves meals and regional drinks such up wine and burukotu (fermented millet grains blended with various seasonings). The farm has the ability and potential to attract future tourists as it now stands. The research's findings show that a substantial number of individuals visit the farm (Paul, 2022 pers.com). The number of visitors or guests at the destination each week is typically less than 30, according to data from key informant interviews. The bulk of tourists, according to research data, are mostly involved in education (research, field excursions).

According to information from key informant interviews, there are typically fewer than 30 visitors or guests at the destination each week. An observation from the research according to research findings that were observed, the majority of visitors to the site have an educational connection (research, field trips, etc.). This might be due to the farm's close proximity to one academic facility. This may be due to the fact that the farm is located adjacent to one academic institution (CRUTECH Ogoja) and is two hours' journey from the farm settlement. As further proof, the Farm is able to entice visitors thanks to the range of agricultural techniques it uses. One of these is an integrated farming system, which integrates many farming techniques that seem to work well together. For example, plantain trees are positioned to provide shade around the fishpond. Additionally, it was found that farm animal excrement is used as manure (fertilizer) for crops. Source (Michael, 2022 pers.com) claims.

In Cross River State, Nigeria, the farm hopes to establish itself as a major hub for economic activities involving agricultural products. When the farm's facilities were examined, it became clear how wealthy the estate was as a travel destination. The practice of tourism makes it abundantly evident that amenities must be taken into account before any tourism enterprise can succeed. According to data gathered from the host community, tourism activities at the destination have been able to positively impact the socioeconomic activities of the

community. This is because tourism opens up opportunities for job creation, the redistribution of resources through commerce, and the integration of urban and rural areas (Micheal, 2022 pers.com).

These advantages extend to the transport unit as well, and individuals take part in economically oriented activities, boosting the local economy. According to the study's findings, agriculture may offer attractions, leisure activities, and educational opportunities in addition to supplying food and other natural products for tourists to consume. Another farm in Cross River State that could be able to support its community through investments in agricultural tourism is Ebo Farm Settlement. The host community has consistently decided that the benefits of agric-tourism are great and that the sector should be grown. This concurs with Sevgi's (2011) assertion that the growth of agric-tourism should be primarily promoted on farmlands and that it has made a significant contribution to the rural development model, particularly in reducing the poverty of women in Kosbucagi Village. This is also consistent with the conclusions of Malkanthi (2011) as one of the factors that most nations across the world promote agric-tourism for in order to sustainably improve rural areas. A viable rural development strategy that can be used to diversify Nigeria's economy and create jobs is agric-tourism for young people and raise the standard of living in the neighborhood. The development of agric-tourism and other all-encompassing programs to combat poverty at the rural level would enhance the standard of living and financial stability of the locals in developing nations, particularly those who live close to ecotourism hotspots (Oladeji & Omotayo, 2013).

The majority of respondents believed that agricultural tourism would be a successful business for Ebo community residents. For those who would be interested in investing in agric-tourism in the Ebo Farm Settlement, this is a really strong foundation upon which to grow. According to Van der Ploeg and Renting (2004), agric-tourism is seen as a way to support economic diversification efforts and preserve agricultural operations.

According to the study, agricultural tourism may give local farmers the chance to boost their income and bring in money for the neighborhood through connections with artisans and community guest houses. The respondents suggested that increasing local food production might lead to greater food security in the research area. The richness and distinctiveness of the traditional food crops grown in the research area will also be highlighted by agric-tourism. The farm property offers a significant potential for developing local and regional markets as well as public-private partnerships that can support sustainable agriculture and the community of Ebo's economic diversity. It may be possible to persuade young people who are rushing to metropolitan areas in quest of career prospects to stay in the fields. In addition to lowering rural-urban migration, this will encourage the preservation of agricultural land in the host community and an increase in crop output. Banking services were mentioned by respondents as another service that will assist the economy and emerge as a result of the multiplier effect. However, agric-tourism will offer the chance to sell farm products directly to tourists and other visitors.

Social impacts are modifications to locals' standard of living that result from tourism-related activity (Wall & Mathiason, 2006). Programs that promote agriculture as a kind of tourism help towns make the most of their natural, historical, and cultural assets. They can also assist to foster a sense of civic pride and enhance the local population's quality of life (Karabati, 2009). lowering poverty is one in an improvement in society.

**Conclusion**

"Examines the potentials of agricultural activity in Ebo Farm Site for agric-tourism development in Yala Local Government Area Cross State, Nigeria" is the stated research objective in this study. If the host town takes the right steps, agric-tourism could be advantageous because it could increase farm income and aid in the development of farm employees. By providing opportunities and increasing capacity, the host community views the farm workers as an essential component of the enterprise. By taking advantage of these opportunities, the farm workers can ultimately improve their own and their children's futures. The present justification for the Ebo community's diversification into agric-tourism would be the requirement for generating extra revenue. However, as described in the international literature, by providing a haven for city people and fostering a genuine experience, it might put agri-tourism in a stronger position for development in the State.

**Contribution to Knowledge**

The study has demonstrated that agricultural tourism can be developed in the Ebo Farm Site in the Yala Local Government Area of Cross State if significant stakeholders (NGOs, government agencies, educators, etc.) work together to foster the local community's understanding of agricultural tourism and to promote its growth and sustainability. Once more, the study has shown to be helpful; as a result, it displays several ecological aspects of the farm settlement, including a river, streams, rocks (monoliths), animals, a hill, and cattle husbandry. This demonstrates how both agricultural tourism and ecotourism improve the watershed region in different ways. The study also revealed that the farm site is beneficial for business travelers who tend to concentrate primarily on purchasing readily available agricultural products as well as significant for medical travelers because the farm site provides medicinal herbs used to treat a variety of disorders. Finally, the study has without a doubt shown that the Ebo Farm Site is ideal for agricultural tourism in all respects.

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# Investigating the Determinants of Cereal Production in Nigeria

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**Abstract**

This study examined the factors that determine cereal production in Nigeria in two different periods; namely from 1970-2006 and from 1986-2021 using the autoregressive distributed lag (ARDL) bounds test. Findings revealed that in the two periods, cereal production was mainly influenced positively by land under cereal production and agricultural raw materials import. Also, while arable land impacted positively on cereal production in the second period, both food importation and rural population growth adversely impacted on its production. The study therefore contends that for cereal production to improve in Nigeria, land under cereal cultivation should be improved. Furthermore, while there is need to encourage the importation of more agricultural inputs in the short-run, the long-run target should be geared towards sourcing the inputs locally. It is equally the view of the study that while it is pertinent to modernize agricultural practice so that the rural inhabitants can embrace farming, excessive cereal importation should be checked to encourage local production.

**Keywords:** *Cereal production, Food importation, Rural population, ARDL*

**Background to the Study**

The achievement of food security has been the preoccupation of successive governments in Nigeria. This is as a result of the understanding that adequate food supply has a direct bearing on the welfare of the people (Nzeh, 2023). Of all the crop types, cereal is very necessary in many respects and its importance formed the motivation for this study. As observed by Ismaila, Gana, Tswanya and Dogara (2010), **c**ereals are the major dietary energy suppliers that provide vital amount of minerals (potassium and calcium), protein and vitamins (vitamin A and C). The study further observed that cereals can be consumed in a number of forms, such as noodles, cakes, pastes, drinks and breads, among others. Furthermore, the husk, bran, plant parts and other residues after processing are relevant as feeds for animals and can as well be used in the culture of micro-organism. Some extract from cereal such as gum and wax syrup also serve as industrial raw materials. In Nigeria, the major cereals produced are rice, maize, pearl millet, wheat and sorghum. As noted by Idem and Showemimo (2004) cited in Ismaila *et al.* (2010), cereal production in Nigeria takes place in the savannah ecology of the country which accounts for about 67 million hectares, representing about 70% of the geographical area. The rise in population in Nigeria coupled with the neglect of the agricultural sector has led to low domestic supply of cereals, leading to high importation. As observed by Ogundiran (2019), Nigeria has been spending so much on food imports, mainly grains and livestock products.

Cereal production in Nigeria has been beset with numerous challenges such as the frequent occurrence of drought occasioned by erratic rainfall especially in the Northern region of the country where cereals are mainly produced (Olaoye, 1999). Also, smallholder producers dominate the agrarian sector in the country that uses traditional farm inputs, resulting in low productivity. In another respect, reports from the 2023 Miller Magazine observed that banditry and kidnapping activities in the primary wheat cultivation Northwest region of Nigeria mostly Borno, Bauchi, Yobe, Kano, Jigawa and Zamfara have adversely affected wheat production in recent times. This threat has also affected corn production as the corn belt comprising Kaduna, Nasarawa and Katsina states has been hard hit by kidnapping for ransom. The report also noted that the recent hike in electricity tariff and petrol (gasoline) add to the cost of rice production which leads to rise in the local rice prices beyond the prices of imported rice. To boost agricultural productivity, report by the Food and Agricultural Organization (FAO, 2023) noted that the government has implemented some initiatives and programmes such as the Nigeria–Africa Trade and Investment Promotion Programme, Economic and Export Promotion Incentives and the Zero Reject Initiative, Agriculture Promotion Policy (APP), Reducing Emission from Deforestation and Forest Degradation (REDD+), Presidential Economic Diversification Initiative, Nigeria Erosion and Watershed Management Project (NEWMAP), among others.

The importance of cereal has led to some studies that have examined the factors that influence its production. It is pertinent to point out that many factors affect cereal production. Empirical studies have included factors such as education level, credit, household size, extension contact, improved seed and off-farm income (Mukhtar, Mohamed, Shamsuddin, Sharifuddin, & Muktar, 2018) as the variables that influence cereal production. Others

included farm size, fertilizer, age, irrigation, arable land and land used for cereal production (Ayele & Melaku, 2019; Asfew & Bedemo, 2022; Garba, Akanni, Yahya, Kareem & Afolayan, 2020). This paper joins the ongoing debate by including factors such as rural population growth, food import and agricultural raw materials import in addition to some other variables that have been used previously such as arable land, land under cereal production and fertilizer consumption. Since cereals are mainly cultivated in the rural areas, the study deemed it necessary to examine the impact of rural population growth on cereal production. This is because most rural agricultural lands have been converted into other uses as a result of rural population pressure. Also, the likely displacement impact of food importation on local food production compelled the study to examine the impact of food import on cereal production. It is mainly owing to this fact that the federal government of Nigeria in recent times placed a ban on the importation of rice and other food items. The inclusion of agricultural raw materials import in the study is based on the fact that some of the inputs used in cultivating food in Nigeria are imported such as fertilizers, pesticides, de-stoning machines for rice production, among others. The contribution of these imported agricultural inputs to cereal production need to be examined.

Improving domestic cereal production is key to achieving food security in Nigeria. However, this cannot be possible if the factors that influence cereal production are not examined, especially the factors that have not been considered by previous related studies in Nigeria. Government policies to boost cereal production could be ineffective if these factors are neglected as this has been among the reasons for weak implementation of agricultural policies in Nigeria. Therefore, this present study is of the view that by investigating the factors that influence cereal production which have been incorporated in the study, policies to improve cereal production could be effective.

**Empirical Literature**

The importance of food on the economy of a country has led to many empirical studies that sought to examine the factors that influence cereal production. In Nigeria, Mukhtar *et al.* (2018) employed the descriptive statistics along with the multiple regressions to reveal that cooperative membership, education level, credit, household size, extension contact, improved seed and off-farm income had a positive and significant relationship with pearl millet output. However, household size and age were shown to have negative association with total output. In Ethiopia, Ayele and Melaku (2019) examined the determinants of cereal crop production of small household farmers in southern region of Kecha Birra woreda. The study revealed that farm size, improved seed, education, fertilizer, age, irrigation and family size influenced cereal crops production positively, while the impact of sex and access to credit was negative. In another study for Nigeria, Garba *et al.* (2020) revealed that the major determinants of cereal yield are cereal production and land used for cereals production. Also, in another study for Ethiopia, Ketema (2020) revealed that fertilizer input import, rainfall, inflation rate and trade openness impacted agricultural output positively and significantly in the long run, while the effect of drought negatively and significantly impacted on it. Akanni, Garba, Banjoko and Afolayan (2020) revealed that cereal production in Nigeria was Granger-caused by the size of farmland used for the planting of cereal.

In a study in Kecha Birra district of Ethiopia, Ayele and Tamirat (2020), found that the variables that significantly influenced cereal crop production are access to credit, use of fertilizer, education level, household head, family size of household head, access to extension service, improved seed and use of recommended agricultural inputs. For wheat production in the Libyan economy, Faraj, Ismail and Ab-Rahim (2020) revealed that while rainfall had a positive but non-significant impact on wheat production, the effect of temperature was negative but non-significant. In a study for Bangladesh, Chandio, Jiang, Fatima, Ahmad and Ahmad (2021) used the ARDL to show that rainfall impacted positively on cereal production in both the short-and long-term. Also, while temperature had an adverse effect on cereal production, energy consumption, financial development and rural labor force improved it. In another study for Ethiopia, Asfew and Bedemo (2022) used the ARDL to reveal that in both the long and short runs, precipitation had a positive and significant effect on cereal crops production, while temperature change adversely affected it. Also, in the long run fertilizer consumption, arable land and carbon dioxide emissions improved cereal production. In Nigeria, Enilolobo, Nnoli, Olowo, Aderemi, Adewole, Olapade and Esedeke (2022) used the ARDL to reveal that domestic capital and bank lending had a positive impact on food security. However, a study in Ghana by Tsiboe, Asravor, Owusu and Mensah-Bonsu (2022) revealed that the major contributors of cereal production are land, seed and agro-ecology of cereal farms.

**Methodology**

Owing to the periods the study sample covered, the study suspected that there may be some structural breaks in the parameters of the model for the study. This could be due to policy issues, natural events, political events or other events that may influence the variables of the study within the period. The study conducted two tests to determine the existence of structural breaks. First, the study plotted the CUSUM and CUSUM of Squares of the model to identify possible outliers in the model. This is based on the stability tests by Brown, Durbin and Ewans (1975) that is based on the recursive regression residuals. The decision rule was to reject the null hypothesis of no structural break if the two plots fall outside the critical bands of the 5% confidence interval. Second, the study conducted the stability test using the Bai-Perron multiple breakpoint tests and the test indicated two break periods: 1986 and 2006. Consequently, the study introduced dummy variables to adjust for the outliers. Thus, the sample was split into two sub-samples: giving room for the estimation of two models. Stationarity test to ascertain the order of integration was carried out by employing both the augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) tests. The test for the cointegrating relationship among the series was conducted using the autoregressive distributed lag (ARDL) bounds. Since the study used annual series, lag 2 was chosen following Pesaran and Shin (1999) which recommend a maximum of 2 lags for annual data.

**Model Specification**

With some modifications from Chandio *et al.* (2021), the functional link between cereal production and its determinants is specified as follows:

$$CP_t = f(LUCP_t, ARMIMPT_t, FC_t, FIMPT_t, AL_t, RPG_t) \quad \text{.....(1)}$$

where: $CP$ = cereal production, $LUCP$ = land under cereal production, $ARMIPT$ = agricultural raw materials import, $FC$ = fertilizer consumption, $FIMPT$ = food import, $AL$ = arable land, $RPG$ = rural population growth. The ARDL model for period one is specified as follows:

$$\Delta CP_i = \varpi_0 + \sum_{i=1}^{p} \varpi_1 \Delta CP_{t-1} + \sum_{t=0}^{p} \varpi_2 \Delta LUCP_{t-1} + \sum_{t=0}^{p} \varpi_3 \Delta ARMIMPT_{t-1} + \sum_{t=0}^{P} \varpi_4 \Delta FC_{t-1}$$

$$+ \sum_{t=0}^{p} \varpi_5 \Delta FIMPT_{e-1} + \sum_{t=0}^{p} \varpi_6 \Delta AL_{t-1} + \sum_{t=0}^{p} \varpi_7 RPG_{i-1} + \varpi_8 CP_{t-1} + \varpi_9 LUCP_{t-1} +$$

$$\varpi_{10} ARMIMPT_{t-1} + \varpi_{11} FC_{t-1} + \varpi_{12} FIMPT_{t-1} + \varpi_{13} AL_{t-1} + \varpi_{14} RPG_{t-1} + DUM1 + \varepsilon_t \quad \text{.....(2)}$$

The ECM form of model one is specified as:

$$\Delta CP_i = \varpi_0 + \sum_{i=1}^{p} \varpi_1 \Delta CP_{t-1} + \sum_{t=0}^{p} \varpi_2 \Delta LUCP_{t-1} + \sum_{t=0}^{p} \varpi_3 \Delta ARMIMPT_{t-1} + \sum_{t=0}^{P} \varpi_4 \Delta FC_{t-1}$$

$$+ \sum_{t=0}^{p} \varpi_5 \Delta FIMPT_{e-1} + \sum_{t=0}^{p} \varpi_6 \Delta AL_{t-1} + \sum_{t=0}^{p} \varpi_7 RPG_{i-1} + \eta ECM_{t-1} + DUM1 + \varepsilon_t \quad \text{.....(3)}$$

where: $\eta$ = coefficient of the ECM, $\varepsilon$ = the error term, $\varpi_1$, $\varpi_2$, $\varpi_3$, $\varpi_4$, $\varpi_5$, $\varpi_6$ and $\varpi_7$ are the short-run parameters and $\varpi_8$, $\varpi_9$, $\varpi_{10}$, $\varpi_{11}$, $\varpi_{12}$, $\varpi_{13}$ and $\varpi_{14}$ are the long-run parameters. $DUM1$ = dummy variable for model one which takes zero (0) values for before 1986 and one (1) after 1986 till 2006.

The ARDL model for period two is specified as follows:

$$\Delta CP_i = \gamma_0 + \sum_{i=1}^{p} \gamma_1 \Delta CP_{t-1} + \sum_{t=0}^{p} \gamma_2 \Delta LUCP_{t-1} + \sum_{t=0}^{p} \gamma_3 \Delta ARMIMPT_{t-1} + \sum_{t=0}^{P} \gamma_4 \Delta FC_{t-1}$$

$$+ \sum_{t=0}^{p} \gamma_5 \Delta FIMPT_{e-1} + \sum_{t=0}^{p} \gamma_6 \Delta AL_{t-1} + \sum_{t=0}^{p} \gamma_7 RPG_{i-1} + \gamma_8 CP_{t-1} + \lambda_9 LUCP_{t-1} +$$

$$\gamma_{10} ARMIMPT_{t-1} + \gamma_{11} FC_{t-1} + \gamma_{12} FIMPT_{t-1} + \gamma_{13} AL_{t-1} + \gamma_{14} RPG_{t-1} + DUM2 + \varepsilon_t \quad \text{.....(4)}$$

The ECM form of model two is specified as:

$$\Delta CP_i = \gamma_0 + \sum_{i=1}^{p} \gamma_1 \Delta CP_{t-1} + \sum_{t=0}^{p} \gamma_2 \Delta LUCP_{t-1} + \sum_{t=0}^{p} \gamma_3 \Delta ARMIMPT_{t-1} + \sum_{t=0}^{P} \gamma_4 \Delta FC_{t-1}$$

$$+ \sum_{t=0}^{p} \gamma_5 \Delta FIMPT_{e-1} + \sum_{t=0}^{p} \gamma_6 \Delta AL_{t-1} + \sum_{t=0}^{p} \gamma_7 RPG_{i-1} + \delta ECM_{t-1} + DUM2 + \varepsilon_t \quad \text{.....(5)}$$

Where: $\delta$ = the coefficient of the ECM for model two, $\gamma_1$, $\gamma_2$, $\gamma_3$, $\gamma_4$, $\gamma_5$, $\gamma_6$ and $\gamma_7$ are the short-run parameters for model two and $\gamma_8$, $\gamma_9$, $\gamma_{10}$, $\gamma_{11}$, $\gamma_{12}$, $\gamma_{13}$ and $\gamma_{14}$ are the long-run parameters. $DUM2$ = dummy variable for model two which takes zero (0) values for periods before 2006 and one (1) after till 2021. In order to test for the existence of co-integration in the two models, the study compared the computed F-statistic with the upper critical bound *I(1)* and the lower critical bound *I(0)*. If the computed F-statistic is greater than the upper critical bound, it proves that there is the existence of cointegration. However, the series are not co-integrated if the computed F-statistic falls below the lower critical bound.

**Variables and Data Sources**

This study used annual data that spanned the periods from 1970 to 2006 and from 1986 to 2021 to investigate the determinants of cereal production in Nigeria. The dependent variable is cereal production, while the explanatory variables are land under cereal production, agricultural raw materials import, arable land, food imports, rural population growth and fertilizer consumption. As defined by the World Bank Development Indicators, cereals comprise of crops harvested for dry grain only. Cereals include rice, maize, wheat, millet, sorghum, barley and oats, among others. Cereal production is measured in metric tons, agricultural raw materials imports is measured as percentage of merchandise imports and land under cereal production is measured in hectares. Also, arable land is measured as a percentage of land area, food imports is measured as a percentage of merchandise imports, rural population growth is measured in annual percentage and fertilizer consumption is measured as a percentage of fertilizer production. Data on all the variables were obtained from the data bank of the World Bank Development Indicators. For normalization, cereal production, land under cereal production and arable land were logged.

**Results Presentation and Discussion of Findings**

The study first considered the results of some preliminary tests which were meant to investigate the behaviour of the variables used in the study. The results of the descriptive statistics in Table 1 indicated that the mean and the median of all the variables are close which implies that the variables are symmetric. It is also revealed that the variable with the highest mean is food import with a mean of 10.56330, while the variable with the least mean is agricultural raw materials import with a mean of 0.701013. The implication of the results is that the country spends more on food importation than on agricultural inputs. The variable with the highest range within the period is food importation which implies that it exhibited the highest volatility. Arable land, on the other hand exhibited the least volatility as it has the least range.

**Table 1:** Descriptive Statistics

| | CP | LUCP | ARMIPT | FC | FIMP | AL | RPG |
|---|---|---|---|---|---|---|---|
| Mean | 7.138 | 31.006 | 0.701 | 7.348 | 10.563 | 7.439 | 1.781 |
| Median | 7.219 | 32.939 | 0.604 | 6.141 | 10.816 | 7.477 | 1.780 |
| Maximum | 7.460 | 40.405 | 2.613 | 15.315 | 27.023 | 7.565 | 2.486 |
| Minimum | 6.764 | 18.079 | 0.000 | 0.216 | 0.000 | 7.216 | 1.259 |
| Std. Dev. | 0.216 | 6.643 | 0.689 | 4.662 | 8.473 | 0.103 | 0.350 |
| Skewness | -0.293 | -0.570 | 0.908 | 0.190 | -0.053 | -0.846 | 0.509 |
| Kurtosis | 1.536 | 2.145 | 3.285 | 1.863 | 1.676 | 2.485 | 2.465 |
| Jarque-Bera | 3.833 | 3.133 | 5.211 | 2.216 | 2.718 | 4.826 | 2.042 |
| Probability | 0.147 | 0.208 | 0.073 | 0.330 | 0.256 | 0.089 | 0.360 |
| Sum | 264.106 | 1147.229 | 25.937 | 271.883 | 390.842 | 275.271 | 65.911 |
| Sum Sq. Dev. | 1.690 | 1588.952 | 17.139 | 782.542 | 2585.012 | 0.381 | 4.417 |

The stationarity results in Table 2 revealed that at level, agricultural raw materials import, and food import achieved stationary under the ADF and PP, while others were not stationary. That is, both variables were *I01).* However, after first differencing, all the variables became

stationary. That is, they all became *I(1).* The stationarity results thus indicated that the series have an admixture of order of integration which suggests that the ARDL is suitable for the investigation of the cointegrating relationship among the variables.

**Table 2:** Stationarity Results

| | ADF | | PP | |
|---|---|---|---|---|
| Variables | Level | First Diff. | Level | First Diff. |
| CP | -2.94(0.92) | -2.94(0.00) | -2.94(0.93) | -2.94( 0.00) |
| LUCP | -2.94(0.83) | -2.94( 0.00) | -2.94(0.76) | -2.94(0.00) |
| ARMIMPT | -2.94( 0.01) | -2.94(0.00) | -2.94( 0.01) | -2.94( 0.00) |
| FC | -2.94(0.25) | -2.94( 0.00) | -2.94( 0.33) | -2.94(0.00) |
| FIMPT | -2.94( 0.03) | -2.94( 0.00) | -2.94( 0.03) | -2.94(0.00) |
| AL | -2.94(0.78) | -2.95(0.02) | -2.94( 0.70) | -2.94( 0.00) |
| RPG | -2.94(0.76) | -2.94( 0.00) | -2.94( 0.63) | -2.94(0.00) |

Next the study investigated the stability of the model parameters using the plots of CUSUM and CUSUM of squares. Figures 1 and 2 revealed that the two plots fall outside the critical bands of the 5% confidence interval. This indicates that the model parameters exhibited outliers within the study period. Since these plots cannot determine the breakpoint dates and the number of breaks, the study carried out the Bai-Perron multiple breakpoint tests and the results in Table 3 revealed two break periods, namely: 1986 and 2006.

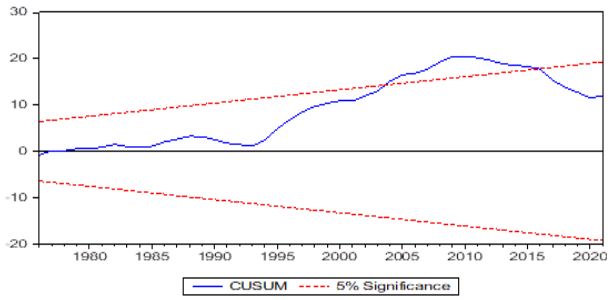


**Fig 1:** Plot of CUSUM

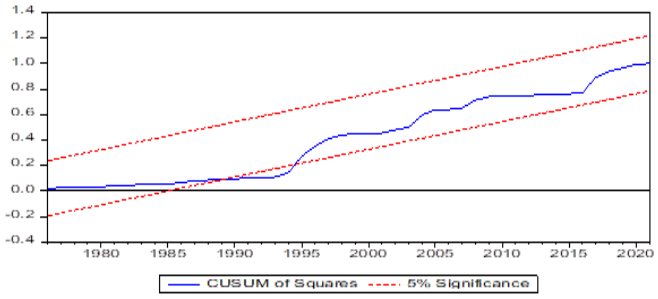


**Fig. 2:** Plot of CUSUM of Squares

**Table 3:** Bai-Perron Multiple breakpoint tests

| Sequential F-statistic determined breaks: | | | 2 |
|---|---|---|---|
| Break Test | F-statistic | Scaled F-statistic | Critical Value** |
| 0 vs. 1 * | 38.30631 | 229.8378 | 20.08 |
| 1 vs. 2 * | 4.740777 | 28.44466 | 22.11 |
| 2 vs. 3 | 3.352676 | 20.11606 | 23.04 |
| Break dates: | | | |
| | Sequential | Repartition | |
| 1 | 1986 | 1982 | |
| 2 | 2006 | 2006 | |

* Significant at the 0.05 level.

Having confirmed the stationarity of the series, the study carried out the test of cointegration among the variables. For model one, the result of ARDL in Table 4 indicated that at the 5% level, the value of F-statistic at 3.729 is higher than the upper critical bound at 3.5. Thus, the study concludes that the variables are cointegrated or have a long-run relationship.

**Table 4** :ARDL Result of Cointegration for Model One

| Test Statistic | Value | K |
|---|---|---|
| F-statistic | 3.729 | 7 |
| | Critical Value Bounds | |
| Significance | *I(0)* Bound | *I(1)* Bound |
| 10% | 2.03 | 3.13 |
| 5% | 2.32 | 3.5 |
| 2.5% | 2.6 | 3.84 |
| 1% | 2.96 | 4.26 |

The results in Table 5 reveal that in the short-run, land under cereal production had a positive and significant impact on cereal production both in the current period and in lag one period. This result finds support in Garba *et al.* (2020) in a study for Nigeria. In the current period also, agricultural raw materials import impacted on cereal production positively and significantly. While fertilizer consumption had a positive but non-significant impact on cereal production, the impact of food import was negative and significant. Also, while arable land was found to have a negative and significant impact on cereal production, rural population growth had a negative but non-significant impact. The coefficient of the ECM is negative and significant which supports the cointegration result and it implies that the system adjusts to equilibrium after a shock at a speed of 57%. The long-run results reveal that both land under cereal production and agricultural raw materials import had positive and significant impact on cereal production. However, both arable land and food importation adversely impacted on cereal production significantly, while the impact of rural population growth though was negative but insignificant. The coefficient of the dummy variable was positive and significant

indicating the relevance of the variable in the long-run.

**Table 5:** Short and Long-run Results for Model One ARDL(1, 2, 2, 0, 0, 2, 0, 2)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| Short-run Results | | | | |
| D(LUCP) | 0.074 | 0.016 | 4.511 | 0.000 |
| D(LUCP(-1)) | 0.044 | 0.016 | 2.596 | 0.018 |
| D(ARMIMPT) | 0.032 | 0.016 | 1.935 | 0.068 |
| D(ARMIMPT(-1)) | 0.013 | 0.009 | 1.524 | 0.144 |
| D(FC) | 0.001 | 0.002 | 0.641 | 0.529 |
| D(FIMPT) | -0.002 | 0.001 | -2.375 | 0.028 |
| D(AL) | -3.659 | 1.038 | -3.523 | 0.002 |
| D(AL(-1)) | -1.818 | 1.065 | -1.706 | 0.105 |
| D(RPG) | -0.043 | 0.029 | -1.494 | 0.152 |
| D(DUM1) | 0.013 | 0.040 | 0.330 | 0.745 |
| D(DUM1(-1)) | -0.049 | 0.037 | -1.312 | 0.205 |
| ECM(-1) | -0.573 | 0.111 | -5.138 | 0.000 |
| Long-run Results | | | | |
| LUCP | 0.044 | 0.022 | 2.005 | 0.060 |
| ARMIMPT | 0.078 | 0.037 | 2.096 | 0.050 |
| FC | 0.003 | 0.004 | 0.657 | 0.518 |
| FIMPIMPT | -0.004 | 0.002 | -2.113 | 0.048 |
| AL | -2.493 | 1.347 | -1.850 | 0.080 |
| RPG | -0.076 | 0.051 | -1.492 | 0.152 |
| DUM1 | 0.235 | 0.055 | 4.223 | 0.000 |
| C | 24.293 | 9.310 | 2.609 | 0.017 |

The ARLD cointegration result for model two in Table 6 indicated that at the 5% level, the value of F-statistic at 6.114 is higher than the upper critical bound at 3.5. Thus, the study concludes that the variables are cointegrated or have a long-run relationship

**Table 6:** ARDL Result of Cointegration for Model One

| Test Statistic | | K |
|---|---|---|
| | Value | |
| F-statistic | 6.114 | 7 |
| | Critical Value Bounds | |
| Significance | *I(0)* Bound | *I(1)* Bound |
| 10% | 2.03 | 3.13 |
| 5% | 2.32 | 3.5 |
| 2.5% | 2.6 | 3.84 |
| 1% | 2.96 | 4.26 |

The results in Table 7 for model two reveal that in the short-run, while land under cereal production had a positive but non-significant impact on cereal production, the impact of agricultural raw materials import was positive and significant after one period lag. While food import had a positive and significant impact in the current period, the impact was negative after one period lag even though it was not significant. In the short-run also, while arable land

had a positive and significant impact on cereal production, rural population growth had a negative and significant impact. It was also found that the coefficients of the dummy variable in both the current period and one period lag are significant, indicating that the inclusion of the dummy in the model is relevant. The coefficient of the ECM is negative and significant which conforms to the result of cointegration. The system adjusts to equilibrium after a shock at a speed of 97%. The long-run results reveal that both land under cereal production and agricultural raw materials import had negative and significant impact on cereal production. Also, while food import and arable land had a positive and significant impact on cereal production, the impact of rural population growth was negative and significant.

**Table 7:** Short and Long-run Results for Model Two ARDL (2, 1, 2, 1, 2, 1, 0, 2)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| Short-run Results | | | | |
| D(LUCP) | 0.001 | 0.003 | 0.495 | 0.627 |
| D(ARMIMPT(-1)) | 0.020 | 0.005 | 3.559 | 0.002 |
| D(FC) | -0.000 | 0.001 | -0.717 | 0.484 |
| D(FIMPT) | 0.002 | 0.000 | 3.074 | 0.007 |
| D(FIMPT(-1)) | -0.000 | 0.000 | -1.325 | 0.204 |
| D(AL) | 0.985 | 0.016 | 59.456 | 0.000 |
| D(RPG) | -0.107 | 0.019 | -5.442 | 0.000 |
| D(DUM2) | 0.002 | 0.023 | 0.113 | 0.910 |
| D(DUM2(-1)) | 0.098 | 0.022 | 4.405 | 0.000 |
| ECM(-1) | -0.966 | 0.114 | -8.405 | 0.000 |
| Long-run Results | | | | |
| LUCP | -0.094 | 0.042 | -2.235 | 0.041 |
| ARMIMPT | -0.095 | 0.014 | -6.647 | 0.000 |
| FC | 0.001 | 0.000 | 1.178 | 0.256 |
| FIMPT | 0.003 | 0.001 | 2.988 | 0.009 |
| AL | 8.848 | 3.377 | 2.620 | 0.019 |
| RPG | -0.111 | 0.022 | -4.973 | 0.000 |
| DUM2 | 0.006 | 0.012 | 0.478 | 0.639 |
| C | -55.551 | 23.841 | -2.330 | 0.034 |

## Discussion of Findings

The study found that in the first period spanning from1970 to 2006, land under cereal production and agricultural raw materials import played significant positive role in cereal production in Nigeria both in the long-run and in the short-run. This reveals that around the seventies and eighties when the sub-sample covered, these variables were very relevant to cereal production. The positive contribution of land under cereal production to cereal production found support in Garba *et al.* (2020) in a study for Nigeria. In another vein, food import was found to impact negatively on cereal production in both the time horizons. This is evidence of the displacement impact of food import on domestic food production in Nigeria. What the study found confusing is the negative impact of arable land within the study period which contradicts the positive impact reported by Asfew and Bedemo (2022), for Ethiopia.

Fertilizer consumption had a positive impact on cereal production which finds support in Ayele and Melaku (2019) in a study for Ethiopia. However, the non-significance of the result implies that the application of fertilizer may not have been embraced fully within the period coupled with the cost of its procurement.

In the second period that spanned from 1986 to 2021, the study also found that both land under cereal production and agricultural raw materials import had significant positive impact in cereal production in the short-run which proves the importance of these variables to cereal production in Nigeria. As expected, arable land had a positive and significant impact on cereal production both in the long-run and in the short-run which could be attributed to improvement in the fertility of land. The negative and significant impact of rural population growth on cereal production is an indication that population growth in the rural area retards cereal production instead of providing the needed manpower for cereal cultivation. A direct consequence of a growing rural population is that there is much pressure on land available for agricultural cultivation. This result is similar to the finding by Mukhtar *et al.* (2018) which found household size to impact negatively on cereal production in Nigeria. However, what the study found curious is the negative and significant impact of land under cereal production and agricultural raw materials import in the long-run within this period. One plausible reason could the negative impacts of banditry, kidnapping and other hostilities visited on farmers across the country which has stifled agricultural activities. The results of the post-diagnostic tests indicated that in model one as shown in Appendix i, the model passed the tests for heteroskedasticity, serial correlation, normality, model specification and stability tests. In model two as shown in Appendix ii, the model also passed all the post-diagnostic tests except the normality test. All the tests were conducted at the 5% and 10% level of significance.

**Conclusion**

This study investigated the determinants of cereal production in Nigeria under two sub-sample periods. In both sample periods, the study found that cereal production was mainly influenced positively by land under cereal production and agricultural raw materials import. Another variable that influenced cereal production positively, especially in the second sample is arable land, while both food importation and rural population growth adversely impacted on cereal production. In all the models, the impact of fertilizer consumption on cereal production was not felt within the sample periods. The study is therefore of the view that for cereal production to improve in Nigeria, adequate provision should be made for land under cereal cultivation. Also, there is need to encourage the importation of more agricultural inputs in the short-run while the long-run target should be geared towards sourcing the inputs locally to conserve foreign exchange. The government should improve on fertilizer procurement and distribution while the use of inorganic fertilizers should be encouraged. It is equally the view of the study that while it is pertinent to modernize agricultural practice so that the rural inhabitants can embrace farming, excessive cereal importation should be checked to encourage local production.

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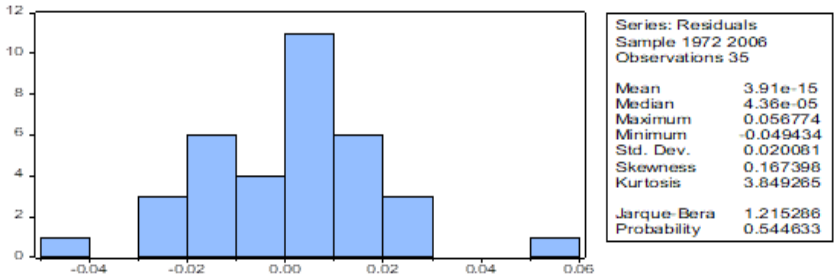
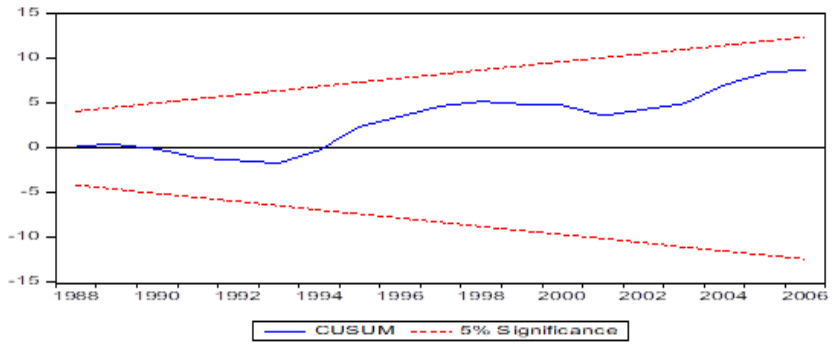
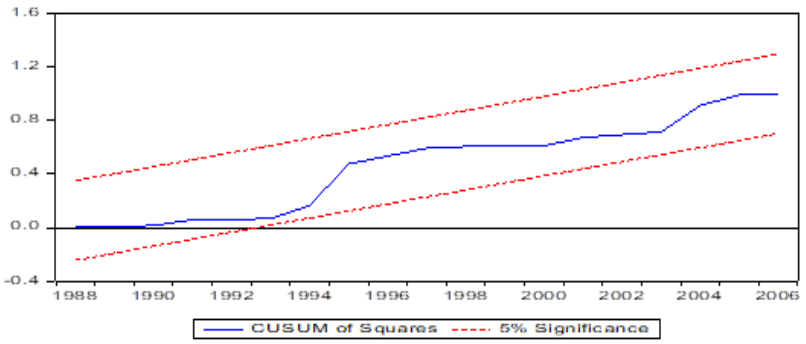
**Appendix i Post-diagnostic Results of Model One**

| Test | P-value | Null Hypothesis | Conclusion |
|---|---|---|---|
| Heteroskedasticity Test: ARCH | 0.9424 | Ho: No Homoscedasticity | Cannot reject Ho |
| Serial Correlation: Breusch-Godfrey LM Test | 0.3173 | Ho: No Serial Correlation | Cannot reject Ho |
| Jarque-Bera (Normality Test) | 0.544633 | Ho: Normally Distributed | Cannot reject Ho |
| Model Specification (Ramsey RESET Test) | 0.3857 | Ho: Correctly Specified | Cannot reject Ho |

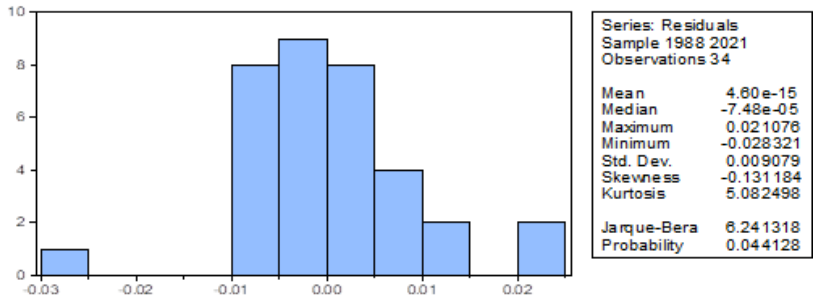


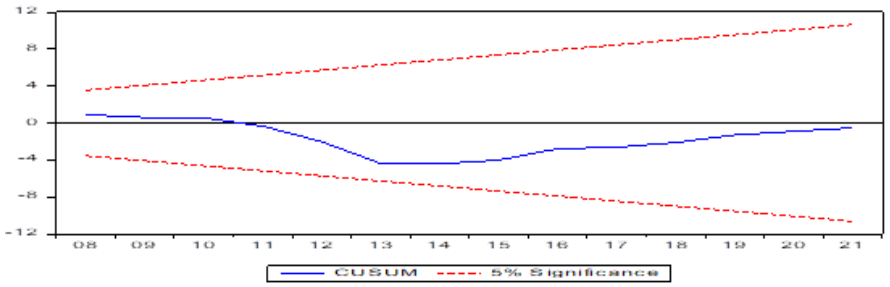



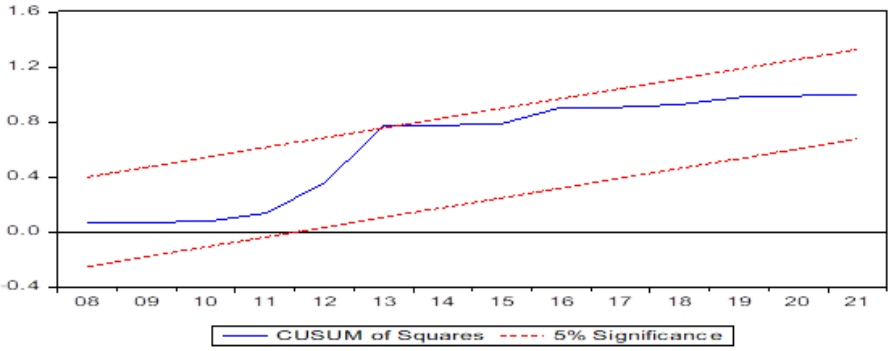




**Appendix ii:** Post-diagnostic Results of Model Two

| Test | P-value | Null Hypothesis | Conclusion |
|---|---|---|---|
| Heteroskedasticity Test: Arch | 0.6200 | Ho: No Homoscedasticity | Cannot reject Ho |
| Serial Correlation: Breusch-Godfrey LM Test | 0.1730 | Ho: No Serial Correlation | Cannot reject Ho |
| Jarque-Bera (Normality Test) | 00.44128 | Ho: Normally Distributed | Reject Ho |
| Model Specification (Ramsey RESET Test) | 0.0868 | Ho: Correctly Specified | Cannot reject Ho |


Series: Residuals
Sample 1988 2021
Observations 34
Mean 4.60e-15
Median -7.48e-05
Maximum 0.021076
Minimum -0.028321
Std. Dev. 0.009079
Skewness -0.131184
Kurtosis 5.082498
Jarque-Bera 6.241318
Probability 0.044128


CUSUM
5% Significance


CUSUM of Squares
5% Significance

# Impact of Monetary Policy Rate on Market Interest Rates in Nigeria

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**Abstract**

The impact of Nigeria's market interest rates on the monetary policy rate (MPR) is investigated in this study. In order to maintain parsimony, we create two indexes to represent deposit and lending rates, respectively: the short-term interest rate (SINT) and the lending interest rate (LINT). The models used are threshold regression and nonlinear autoregressive distributed lag (NARDL). Monthly data from 2002:M1 to 2019:M12 are used in the study. According to the threshold regression model's results, MPR has a more substantial and larger impact on SINT and LINT over the projected thresholds of 11 and 13 percent, respectively, than it would if it were below the threshold. Additionally, results from the nonlinear ARDL model demonstrate that a drop in MPR has a negative impact on lending and short-term interest rates, whereas an increase in MPR has a favorable effect. The extent of the negative effect is negligible for LINT and statistically insignificant for SINT. This illustrates how prices are sticky downward, supporting the claim that MPR is only ineffective when modified downward. To increase the effectiveness of monetary policy, we advise the monetary authority to concentrate on banking sector reforms that eliminate downward rigidities in the impact of MPR on interest rates.

**Keywords:** *Interest rate, Monetary policy rate, Nonlinear threshold regression*

**Background to the Study**

The central bank of Nigeria, like in a number of other nations, has long used monetary policy as a crucial framework for enacting the intended macroeconomic goals. The monetary policy rate (MPR) as a crucial tool of monetary policy that the monetary authority uses in this context. The minimal rediscount rate (MRR) was replaced by the MPR in 2006 by the Central Bank of Nigeria (CBN), since the MRR was deemed to be relatively unsuccessful. The CBN has used the MPR as one of its monetary policy tools since it was adopted, using it to set goals and guidelines for other rates (Aliyu et al., 2017). Interest rate pass-through (IRPT) is thus one method by which the efficacy of monetary policy can be assessed. The method by which bank interest rates react to changes in the MPR is known as the IRPT (Rehman, 2009). It is anticipated that the MPR will announce the Monetary Policy Committee's decision and serve as a reference point for other interest rates. Still up for debate, though, is how well the MPR works to affect other interest rates.

Different approaches to evaluating cases, both within and between nations, in order to determine the effectiveness of MPR have produced inconsistent results. Weth (2002) contended that although there are others who contend that IRPT is weak and inadequate in the short term, it is complete in the long term (Aydin, 2007; Marotta, 2009). However, another group argues that, at least for the near term, IRPT is complete (Crespo-Cuaresma et al., 2004). The Nigerian CBN modifies the MPR as a tool for policy, the CBN of Nigeria modifies the MPR in order to sustain price and monetary stability while promoting economic expansion. The CBN's continued use of this tool indicates that the monetary authority implicitly believes in its efficacy. But there have been doubts about this tool's efficacy. Research has shown that the MPR is not very good at representing changes in the nation's short- and long-term interest rates (Kelilume, 2014). This claim states that it is impractical to employ monetary policy to achieve macroeconomic goals since it can have little to no impact on credit control and, by extension, the money supply.

Therefore, a better understanding of the relationship between the MPR and interest rates is essential to Nigeria's monetary policy, given the country's ongoing reliance on the MPR and the argument against its effect on interest rates. However, the scope of Nigerian IRPT literature is still quite narrow. In light of this, this study looks into how the MPR affects a few different market interest rates in Nigeria. Sanusi (2010) asserts that since the banking industry's consolidation, Nigeria's IRPT has gotten even weaker. Therefore, identifying the precise and varied levels at which MPR affects other rates could yield higher value in a period where the need for policy efficacy is growing.

This research is distinct in that it uses a non-linear and threshold regression approach to investigate the previously described link in Nigeria. Studies examining the relationship between Nigeria's policy rate and other market interest rates employ a linear methodology. Ridge regression, structural VAR (SVAR), or vector autoregression (VAR) can be used for this (Sanusi, 2010; Kelilume, 2014; Aliyu et al., 2017; Mordi et al., 2019). These frameworks might be useful for studying interest rate passthrough, but they are unable to identify the non-linear effects of monetary policy—that is, proportionate increases or decreases in other rates. This is

the question that this research aims to answer, especially in light of interest rate rigidities (Hannan & Berger, 1991). Evidence for potential disparities in the retail rate adjustment process (savings rate) in response to the monetary policy rate is shown by Mordi et al. (2019). We investigate the impact of a rise and a drop in MPR on other market rates using a non-linear autoregressive distributed lag (NARDL) model. Policy shocks can have different effects in terms of direction, importance, and size. A non-linear analysis like this provides relevant policy insights about the efficacy of a change in the MPR, whether it is positive or negative.

Furthermore, we speculate that the previously described association might be susceptible to different thresholds. Following the 2008 financial crisis, which saw the MPR drop to an all-time low of roughly 6%, the policy rate has risen to over 10% and has been continuously varying between 12% and 4%. As a result, this study adds value by examining how the MPR affects other market interest rates in light of the several ways that it has been altered. As a result, the inquiry can determine whether or not the MPR levels have an impact on other market rates. Finally, in order to maintain parsimony, we created two indices to represent deposit and lending rates, respectively: the short-term interest rate (SINT) and the lending interest rate (LINT). These indices, which combine short- and long-term interest rates into their respective measurements, offer a distinctive depiction of those rates.

In summary, this research offers proof of nonlinearities and the impact of the regime's witching behavior on the MPR. The path in which monetary policy can be implemented to maximize efficacy is clarified by these findings, which are significant for policymakers. The following are the remaining sections of this paper: In Section 2, styled facts and a review of the literature are presented. An explanation of the data and technique is given in Section 3. Section 4 examines and presents the findings, while Section 5 provides the study's conclusion and some policy recommendations.

## Literature Review

### Theoretical Literature

The method by which the MPR transmits to different interest rates is known as interest rate pass-through (IRPT) (Rehman, 2009; Kovanen, 2011). This section discusses the primary points of contention and methods used in the theoretical literature. All of these ideas concur that MPR plays a significant role in figuring out other interest rates. Their differences lie in the way or extent to which MPR affects market rates.

Monti and Klein's (1971) typical theoretical model are used to analyze how MPR affects market rates. According to this concept, assuming markets are perfectly competitive, the IRPT will react to the monetary policy rate quickly and entirely symmetrically. This model is predicated on the notions that there is no switching cost, information asymmetry, and imperfect competition in the financial markets. As a result, full pass-through is considered a long-run phenomenon, with short-term deviations from the long-run equilibrium.

For several reasons, IRPT can be determined to be sticky, complete or incomplete, symmetric or asymmetric. Under asymmetric IRPT (Stiglitz & Weiss, 1981; De Bondt, 2005), banks may

choose to pass on the cost of an increase in the policy rate to borrowers by increasing the bank rate in addition to the policy rate increase in order to offset the risk. There is a chance that something else will happen, and the interest rate won't rise in response to a rise in the policy rate. The rationale behind this is that a rise in bank rates is likely to deter low-risk borrowers, hence creating an adverse selection environment where high-risk borrowers are more inclined to engage in high-risk activities, or moral hazard. To put it another way, when lending rates rise, borrowers often take on riskier ventures. Because asymmetric knowledge exists, bankers ration loans to achieve equilibrium in the loan market rather than raising their rates above the increase in the policy rate. This combination of possibilities proves to be asymmetrical.

Furthermore, financial frictions can cause enormous swings in economic activity, which in turn influence retail rates, as demonstrated by Bernanke et al. (1996). If there is an information asymmetry and lenders are unable to differentiate between borrowers who pose a low or high risk, they will require all borrowers to pledge collateral. Thus, a rise in the policy rate, indicating a tightening of monetary policy, devalues the borrowers' assets and makes it harder for them to borrow money for investments. A vicious cycle develops whereby a weakened economy further depresses asset values, which in turn causes tighter lending terms that further curtail economic activity. In such a vicious cycle, the policy rate may trigger an overpass-through on retail rates.

Macroeconomic factors also influence retail rates' stickiness (Egert et al., 2007; Egert & Macdonald, 2009). Policy signals lose some of their informational value when macroeconomic conditions are highly volatile. As a result, bankers may decide to implement gradual interest rate parity (IRPT). On the other hand, during times of significant macroeconomic volatility (high inflation), interest rate passthrough may occur more quickly. Banks try to modify their rates in response to rapidly fluctuating prices in order to maximize their profit; as a result, IRPT is quicker.

Menu cost provides an additional explanation for interest rate stickiness (Rotemberg & Salone, 1987). According to the menu-cost theory, banks will only change their rates if the benefits outweigh the associated costs (such as new price list advertising and communication costs). Stated differently, slight variations in policy rates could result in a postponed or negligible shift in retail rates. Retail rate rigidity can also be attributed to changing costs, according to Lowe and Rohling (1992). If the expense of switching banks offsets the impact of the bank's higher interest rate, customers may find switching to be more expensive. Therefore, a high switching cost could be a sign of both asymmetric adjustment and stickiness in retail prices. On the other hand, banks would probably give their customers implicit contracts with more stable interest rates if they wanted to maintain their long-term ties with them (Fried & Howitt, 1980; Berger & Udell, 1992).

The ownership structure of the financial sector may also have an impact on interest rate pass-through (Grigoli & Mota, 2017). When it comes to political considerations and inefficiencies, state-owned financial institutions that prioritize policy over profit may opt to postpone interest rate changes. Analogously, collusive oligopolistic behavior could result from a financial

system controlled by a small number of banks (Hannan & Berger, 1991). The collusive conduct hypothesis states that because higher deposit rates mean higher costs for banks, they may stiffen up after an increase in the MPR. Likewise, as lower lending rates translate into lower bank profits, lending rates may exhibit downward rigidity in response to monetary policy rate reductions.

In conclusion, the previously discussed ideas show that the usual theoretical model for analyzing the effects of MPR on market rates may not always adhere to the perfectly competitive market premise. The speed at which MPR influences other interest rates is determined by a variety of micro- and macroeconomic parameters, according to a survey of the theoretical literature on IRPT. Furthermore, a number of these factors are outside the purview of policymakers, which helps to explain why the monetary policy rate is ineffective in influencing other rates and, consequently, the results of macroeconomic aggregates.

**Empirical Literature**

The majority of IRPT empirical research focuses on the extent and rate at which changes in money market rates affect banking rates, as well as the differences between short- and long-term shifts in market interest rates relative to monetary policy rates. The methodologies and scope of these studies vary, depending on whether they focus on cross-national or individual behavior.

Tai et al. (2012) looked into how different Asian countries' lending and deposit rates were from the monetary policy rate in terms of pass-through. Using an apparently unrelated regression (SUR), the research revealed that although the pass-through to the lending rate is marginally higher than the deposit rate, the transmission rate is slow. Examining the impact following the dot-com collapse in 1997, the research revealed that most countries saw a significantly slower rate of adjustment.

Slovenia, Slovakia, Poland, Hungary, and the Czech Republic are the five Central and Eastern European nations (the CEE-5) that Egert et al. (2007) studied using the IRPT. The study's conclusions supported the empirically known fact that IRPT is significantly greater for corporate lending rates and short- to long-term deposits but significantly lower for overnight rates. The study's main result was that the pass-through was larger for the CEE-5 countries than for other core euro-area countries. However, over time, the pass-through in the CEE-5 looked to drop, indicating that the rise in heterogeneities in the euro-area had stopped. In the Central African Economic and Monetary Community, Samba and Yan (2010) investigated the monetary transmission mechanism of the interbank rate of return (IRPT) from short-term interest rates to long-term rates. The policy rate had an extremely low and imperfect long-run pass-through to the deposit rate, according to the findings. However, they discovered a significant overshooting effect on loan rates.

Yildirim (2012) looked into the possibility of asymmetric lending rate movement in Turkey as a result of monetary policy and financial market conditions. The study, which used threshold autoregressive models (TAR), discovered that there are significant asymmetries and that

banks react more slowly to a decrease in money market rates than they do to increases in them. Additionally, sectoral heterogeneities were discovered, indicating that banks' resistance to trailing declines in money market rates differs depending on the lending rate. Using a comparable econometric technique (the TAR model), Tang et al. (2015) looked at the policy rate pass-through effect on retail rates in Malaysia. The study discovered downward rigidities in the response of both lending and deposit rates, in addition to incomplete policy rate pass-through to deposit and lending rates. The findings of Levine and Loeb (1989), Dueker (2000), and Tkacz (2001) are supported by these data. Similarly, Grigoli and Mota (2017) investigated the inequalities in the retail rate adjustment to changes in the monetary policy rate for the Dominican Republic using the same technique. It discovered a complete pass-through, in contrast to the earlier research, indicating the efficacy of the monetary policy transmission mechanism. Different findings, meanwhile, show that while lending rates respond more quickly to policy rate decreases, deposit rates respond more quickly to policy rate hikes.

There aren't many studies (Sanusi, 2010; Mordi et al., 2019; Aliyu et al., 2017; Kelilume, 2014) on how monetary policy affects market rates in Nigeria, and most of them focus on the size and speed of the effect. Kelilume (2014) used the multivariate vector autoregressive (VAR) model to study the impact of MPR on both short- and long-term interest rates. The results show that there was little monetary policy transmission to interest rates in Nigeria. The analysis discovered that while the pass-through to the maximum lending rate and the savings rate was incomplete, the pass-through to the interbank, Treasury bill, and prime lending rates was complete. The results underscored the possibility that an inadequate incentive framework could account for the inadequate and partial monitoring of the savings rate. The impact of MPR on Nigeria's short- and long-term interest rates was studied by Aliyu et al. (2017). The study discovered that the Monetary Policy Rate has the greatest influence on Treasury bill and interbank rates by utilizing a combination of models (principal component, ridge regression, and OLS). Nonetheless, it discovered a statistically negligible and negative correlation between lending rates and the MPR. This begs the question of whether lending rates should continue to be determined by the MPR.

Similarly, Sanusi (2010) calculated the size and rate of the interbank rate differential (IRPT) between the retail and deposit interest rates in Nigeria and the monetary policy rates using a structural VAR (SVAR) approach. According to the report, pass-through in Nigeria is typically delayed and incomplete. However, compared to retail lending and deposit rates, the MPR to the interbank rate is much higher and occurs much faster. Additionally, during the post-consolidation period, the MPR's pass-through to money market rates rose; but, in contrast to the pre-consolidation period, the pass-through to retail and deposit market rates fell. Therefore, the study concludes that despite financial sector changes, inefficiencies in the retail and deposit markets persisted, making monetary policy ineffectual and inefficient.

Moreover, Mordi et al. (2019) looked at the MPR's interest rate pass-through magnitude and adjustment pattern to a few selected Nigerian retail interest rates. The study used an error correction model (ECM) technique to take asymmetric adjustment and structural breaks into consideration. The results demonstrated notable structural fractures as well as a long-term link

between the prime lending and savings rates and the monetary policy rate. However, the results showed that the retail rates were rigidly adjusted in response to the monetary policy rate, leading to incomplete IRPT. Furthermore, all other retail rates, with the exception of the savings rate, adjust symmetrically, suggesting that the way savings rates react varies based on changes in MPR. Stated differently, positive shocks to MPR react to changes in savings rates more quickly than negative shocks.

Moreover, Tule (2014) used a VAR model to evaluate how responsive Nigeria's short-term interest rates were to shifts in the monetary policy rate. According to the study, the 3-month deposit rate and the Treasury bill rate have lower long-term interest rate parity to money market rates than do the maximum and prime lending rates. According to the findings, structural rigidities that could impede the transmission of monetary policy signals may be indicated by the variations in impact. Additionally, banks give fluctuations in the interbank rate more weight when assessing their choices about their marginal cost of funds in an effort to make up for these deficiencies.

The pass-through of MPR on other interest rates has been studied in the literature for IRPT in Nigeria using a variety of econometric techniques, such as OLS, VAR, SVAR, ridge regression, and ECM. Even while the results concur on the stickiness and incompleteness of the MPR influence on other rates, their applicability is still constrained. The IRPT of MPR and other rates were primarily treated as linear in Nigerian studies, while there may actually be a non-linear relationship.

Using data that ended in 2014, Mordi et al. (2019) demonstrated the likelihood of asymmetry in the retail rates' (savings rate's) adjustment process in response to the monetary policy rate. Nevertheless, our research broadens the focus to encompass significant eras characterized by recent economic recessions. We investigate the significance, amplitude, and direction of an increase or drop in MPR on other market rates using a non-linear autoregressive distributed lag (NARDL) model. According to research by Mordi et al. (2019), the majority of lending rates—aside from savings rates—respond symmetrically to shifts in MPR.

In this work, we use principal component analysis to aggregate these various rates into an index for parsimony. The index, which stands for short-term deposit rates and lending rates, respectively, is referred to in the study as the short-term interest rate (SINT) and lending interest rate (LINT). This index, which compiles data on the chosen lending and short-run interest rates into distinct indices, is a unique depiction of the two types of interest rates. Furthermore, as Sanusi (2010) noted, Nigeria's IRPT has weakened even more since the banking sector consolidation. As a result, in an era where policy effectiveness is becoming more and more important, greater value could be harnessed by using threshold analysis to examine the various levels at which MPR influences other market rates.

In order to achieve this, this study contributes to the IRPT literature by utilizing a threshold and non-linear analysis to further explore how short-term deposit rates in Nigeria react to changes in the monetary policy rate. This study is distinct from previous studies in the

literature because it aims to investigate potential nonlinear impacts in addition to the implications of the monetary policy rate's regime-switching behavior. Because it clarifies the direction that monetary policy can be used to achieve greater efficacy, this study is relevant to policy.

**Stylised Facts**

This section delves deeper into concerns about MPR's effectiveness by examining how the rate behaves in relation to many other market rates and important macroeconomic variables. As demonstrated in Figure 2, the domestic macroeconomic situation from 2002 to 2005 was marked by relatively stable Naira exchange rates, a gain in foreign reserves, and both significant rises and decreases in real GDP. But in 2006, there were disruptions like oil pipeline vandalism in the oil-producing region, which had an impact on oil production and earnings and decreased GDP growth (CBN Communique, 2006). Furthermore, a rise in the inflation rate was another feature in 2006. The monetary policy committee (MPC) chose to keep the cash reserve ratio (CRR) at 5% while raising the MRR from 13% to 14% (see Figures 1 and 2). This move was made in an effort to maintain price stability. When the inflation rate started to decline in June 2007, that's when this rate was examined (CBN Communique, 2007).

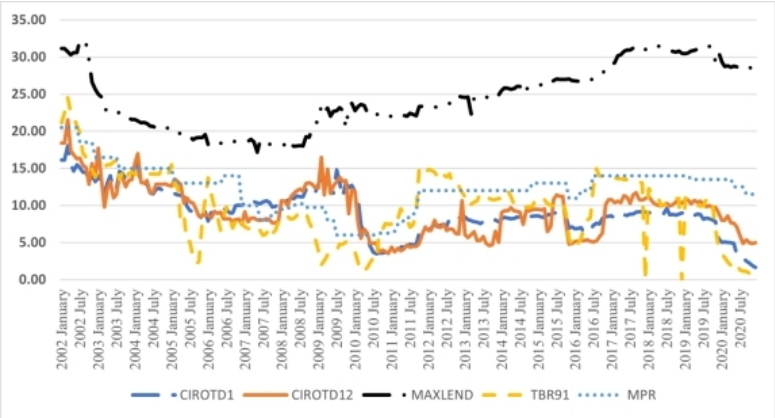


**Figure 1:** Interaction Between MPR and some selected market rates.
**Source:** Researcher's computation, 2024

In 2014, the Nigerian macroenvironment remained robust and resilient, with a degree of stability in pricing and output, notwithstanding the decline in oil prices that was partly caused by the shale oil revolution (CBN Communique, 2014). As a result, the financial system's liquidity increased. The banking system's improved liquidity circumstances, intended to increase its resilience and stability, did not result in an increase in credit availability to the real sector because of incomplete interest rate pass-through. Rather, when the liquidity conditions improved, inflation increased (refer to Figure 2). The MPC agreed to implement a tightening measure by raising the MPR to 13% from 12% in order to reduce these inflationary impacts (CBN Communique, 2014). Between 2014 and 2016, the MPR saw shifts in several directions due to both internal and international events (see Figures 1 and 2). One such instance is the

Brexit vote, which exacerbated volatility and fragility in the world's financial system (CBN Communique, 2016). Domestically, there was a consistent increase in MPR from 11–12% and 12–14%, respectively, in March and July of 2016 (CBN Communique, 2016). This was done to reduce the steadily rising inflationary pressure (as shown in Figure 2), which was brought on by a shortage of gasoline, higher energy tariffs, a lack of foreign exchange, and the high cost of factor inputs related to the nation's economic downturn at the time.

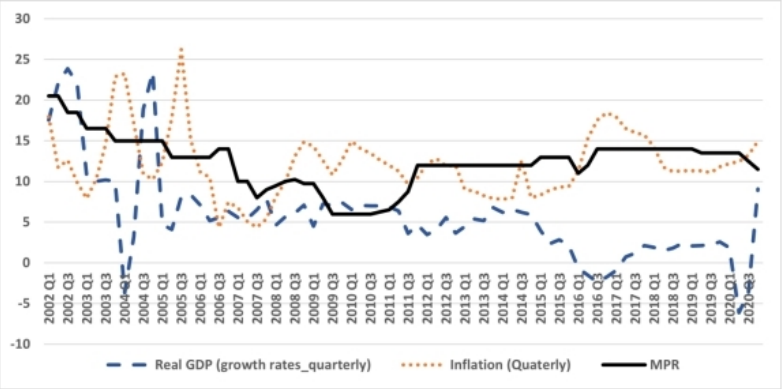


**Figure 2:** Communication between a few chosen macroeconomic variables and MPR.
**Source:** Researcher's computation, 2024

Nonetheless, 2019 saw a number of significant international developments, including the US-China trade war, a decrease in global output, ongoing ambiguity surrounding the BREXIT negotiations, regional wars in the Middle East, and a slowdown in China's output growth (CBN Communique, 2019). The domestic economy was steady despite these global headwinds, with a modest increase in real GDP and a moderate drop in headline inflation (see Figure 2). With the exception of a minor decrease from 14 to 13.50% in March 2019, the MPR was therefore maintained for the majority of the periods (CBN Communique, 2019).

The CRR was increased from 22.5-27.5% in January 2020 due to the ongoing inflationary pressure that resulted from the border closure in 2019 (which stood at 11.98% as of December 2019) (CBN Communique, 2020). However, the ongoing coronavirus spread resulted in exchange rate volatility, rising public and corporate debt, rising unemployment, tightening financial conditions, reversals in capital flows, negative shocks to commodity prices, and a slowdown in global industrial activity. As a result, the MPC decided in May 2020 to lower the MPR from 13.5–12.5% (refer to Figures 1 and 2) in an effort to mitigate some of the COVID-19 pandemic's effects.

## Data and Methodology

### Data

Secondary data from the Central Bank of Nigeria Statistical Bulletin for 2020 was used in the study. It spans the monthly years 2002–M1 through 2019–M12. The money supply (M2), lending interest rate (LINT), monetary policy rate (M1), and short-term interest rate (SINT) index are among the variables that are considered. Principal component analysis is utilized in

the computation of the short-term interest rate index is calculated using principal component analysis. There are two computed indices. LINT is the lending rate, and SINT is the short-term savings rate. The interest rates on time deposits from commercial banks maturing for seven days (CIROTD7), one month (CIROTD1), three months (CIROTD3), six months (CIROTD6), and twelve months (CIROTD12) are the variables used for SINT computation. These interest rates are thought to fall into the short-term interest rate category because of their maturity durations. LINT is computed using the prime lending rate (PLR) and the minimum lending rate (MLR) are the variables used in the computation of LINT. Because of its theoretical relationship to interest rates, the money supply (M2) acts as a control variable in the model (Mishkin, 1996).

Analysis of Principal Components (PCA) A multivariate statistical method called principal component analysis (PCA) is used to condense a set of data's variables into a significant number of dimensions (Abdi & Williams, 2010). PCA takes an initial set of n correlated variables and turns them into a set of uncorrelated components. Each component is a linearly weighted combination of the initial set of variables. Considering a collection of variables X1–Xn,

PC1 = a11X1+a12X2+ +a1nXn
:::
PCm = am1X1+am2X2+ +amnXn

in such a way that amn stands for the weight of the nth variable and the mth principal component. The associated matrix's eigenvectors provide these weights. The eigenvalue of the appropriate eigenvector yields the variance for each primary component. Under the condition that the total of the squared weights (a211+a212+...+a2 1n) equals 1, these parts are organized so that the first part explains the greatest amount of variation in the original.

**Theoretical Framework**

The marginal cost pricing model is the theoretical framework that was used for the investigation (De Bondt, 2005). This is in accordance with the Monti-Klein framework (Monti 1971; Klein 1971), which postulates the existence of a perfectly competitive market devoid of menu costs, transaction costs, and asymmetric knowledge, where price equals marginal cost. Under such circumstances, the marginal change in price relative to the marginal cost equals unity. Stated differently, the transfer is direct because the official rate accurately represents the underlying cost of financing. The relationship between the different market rates and the monetary policy rate is represented by the following model when the framework is applied algebraically:

$$MRt=a+b*MPRt+et \quad (1)$$

Where MR represents the market interest rates (SINT; LINT), MPR is the monetary policy rate, a is the constant mark up and b is the coefficient for the interest rate pass-through. Under a perfectly competitive market, the MPR coefficient, b, would equal unity. Lastly, e is the error term. In this study, equation 1 extends the existing theoretical model by considering nonlinear relationship as discussed in the model specification.

**Model Specification**

The study's analysis made use of non-linear ARDL models and Hansen's (1999) threshold regression estimate approach. The non-linear ARDL helps figure out how changes in MPR affect short-term interest rates in a way that isn't linear, as well as how strong and important those effects are. The threshold regression, on the other hand, lets you switch between regimes, which helps you figure out how MPR affects interest rates at a certain level.

**The Threshold Regression**

The threshold estimation technique is chosen for the investigation instead of Markov switching models because of two key conceptual distinctions. There are two things to note: while regime changes in threshold regression are preset, they are endogeneous in Markov switching models. Firstly, Markov switching models integrate less prior knowledge than threshold regression. Because of the additional disturbances in the Markov evolution equation, changes in Markov switching could not be reliably predicted from historical data, even if the model parameters were known (see Koop & Potter, 1999).

Assume that the following linear model describes the relationship between MPR and other interest rates.

$$rt = \mu 0 + \mu 1 MPR + bM2 + et \qquad (2)$$

Where rt stands for the interest rates (SINT and LINT), MPRt , the monetary policy rate (the threshold variable), M2, money supply, and et , the error term in the model. μ0; μ1 and b are the regression parameters. According to Hansen's (1999) framework, equation (1) can be respecified to accommodate threshold components. To model the Hansen framework with Equation (2), a threshold is established using MPR, such that MPR is equal to or less than the threshold, as well as greater than the threshold, is measured against the interest rate as shown in equation (3) below:

$$rt = \mu 0 + \mu 1 MPRtr(MPR \ l) + \mu 2 MPRtr(MPR > l) + bM2t + et \qquad (3)$$

where MPR is the threshold variable, and it is adopted to test for the presence of the threshold effect of MPR on interest rates. l is the threshold parameter, and I(.) elicits the function that assumes unity (1) if MPR is lower than or equal to the determined threshold value (l) and 0 otherwise. A complete effect would occur if a unit increase in MPR results in a unit or more than a unit increase in I, that is, if μ1 and μ2 are each greater than or equal to one. Otherwise, the effect is incomplete. Equation (2) can also be partitioned into two regimes, depending on whether the threshold variable is lower than or higher than the estimated threshold. These regimes are isolated by different regression parameters in μ1 and μ2 as follows:

$$rt = \mu 0 + \mu 1 MPRt + bM2 + et \text{ ; if } MPR \leq \lambda \qquad (4)$$

$$rt = \mu 0 + \mu 2 MPRt + bM2 + et \text{ ; if } MPR > \lambda \qquad (5)$$

Equations 4 and 5 represent the regime below and above the threshold, respectively. Money supply (M2), which is a control variable in the model, is regime-invariant. The ordinary least square method is used to estimate the threshold in equation 3, and the sum of squared errors (S1) is found for all the threshold variables in the model that can be estimated. S1 is computed

as ˙2(l0)˙2(l) (this reflects the sum of square error in matrix notation, identifying the gap between the mean observation and its group mean). Next, the threshold parameter is obtained by minimizing (S1), such that ¯Y = argminY S1(Y) (that is, the parameter for the threshold variable is obtained by minimizing the sum of the squared errors). It is important to test if the endogenous threshold is statistically significant once it has been determined. The null.

**Hypothesis**: There is no threshold effect (H0: 1 = 2). This implies that the slope coefficients are similar in the two regimes. Hence, under H0, equation (3) is similar to the linear model in equation (2). The likelihood ratio test for the null hypothesis is based on the F-statistic: F1 = (S0-S1(Y))/a` 2 where S0 and S1 represent the sum of squared errors under the null hypotheses, and a` is the estimate of the regression error variance (a2). Because the threshold value is not identified under the null hypotheses, the asymptotic distribution of F1 is not standard. To address this, Hansen (1999) suggests a bootstrap method to simulate the probability value for the F-statistic (F1). For a threshold to exist, it is expected that, from equation (3), μ

**Non-linear ARDL Model**

Shin et al. (2013) created the non-linear ARDL (NARDL) model. It is the conventional ARDL model's asymmetrical expansion, created by Pesaranet et al. (2001). One benefit of the ARDL model is that it can produce reliable results when the series are I(0), I(1), or a combination of the two. It also lets you include both independent and dependent factors in the model, and it might be possible to fix endogeneity in the explanatory variables (Caporale & Pittis, 2004). The classic ARDL model, from which the NARDL is formed, is described in the paper, as the NARDL is the asymmetrical derivative of the linear ARDL model. The ARDL model is given two variables, x and y, as follows:

$$\text{yt} = \sum_{i=1}^{q} \alpha i \Delta yt{-}i + \sum_{j=0}^{p} + \beta i \Delta xt{-}j + \gamma 1 yt + \gamma 2 xt + \varepsilon t \quad (6)$$

Following the work of Shin et al. (2013), NARDL can be derived from equation 6 by replacing x*t* with (X+) and (X−) in the linear ARDL model as follows:

$$\Delta y_t = \sum_{i=1}^{q} \alpha i \Delta y_{t-i} + \sum_{j=0}^{p} \beta 1 i \Delta x^{+}_{t-j} + \sum_{j=0}^{p} \beta 2 i \Delta x\text{-}_{t-j} + \gamma_1 y_t + \phi 1 x_t^{+} + \phi 2 x_t^{-} + \varepsilon t \quad (7)$$

Equation (7) can be reparametrized to incorporate the variables of interest as follows:

$$\Delta r_t = \sum_{i=1}^{q} \alpha i \Delta r_{t-i} + \sum_{j=0}^{p} \beta 1 i \Delta MPR_t^{+}{}_{-j} + \sum_{j=0}^{p} \beta 2 i \Delta MPR^{-}_{t-j} + \sum_{j=0}^{p} \beta 3 i \log(M2)_t \gamma_1 rt + \phi 1 MPRt^{+} + \phi 2 MPRt$$
$$^{-} + \phi 3 \log(M2)t + \varepsilon t \quad (8)$$

The independent variable is decomposed into positive ($X+$) and negative ($X-$) changes in Shin *et al,* (2013) as follows:

$$MPR+_t = \sum_{k=1}^{t} \Delta MPR+_k = \sum_{k=1}^{t} \max(\Delta MPR_k, 0) \quad (9)$$

$$MPR-_t = \sum_{k=1}^{t} \Delta MPR-_k = \sum_{k=1}^{t} \min(\Delta MPR_k, 0) \quad (10)$$

Equations (9) and (10) isolate the positive and negative changes in the policy variables in the model, where X is a vector of policy variables in the model.

**Results and Discussion**

Table 1 below shows the descriptive characteristics of the series used in the models. The nation experienced an average monetary policy rate (MPR) of 12.29 percent during the study period, with a minimum rate of 6 percent and a maximum rate of 20.5 percent. It is anticipated that this rate would affect other market interest rates. A high short-term interest rate ought to follow a high MPR, and vice versa. During the study period, the average rate of the short-run interest rate (SINT) was 17.67 percent, with a minimum of 14.58 percent and a maximum of 26.38 percent. Additionally, during the study period, the lending interest rate (LINT) had an average rate of 30.19 percent, with a low of 25.65 percent and a maximum of 30.68 percent. Throughout the periods, the wide money supply similarly showed a mean value of roughly NGN12.3 trillion, with a minimum of NGN 1.3 trillion and a maximum of NGN 29.1 trillion.

**Table 1:** Descriptive statistics

| | MPR | M2 | SINT | LINT |
|---|---|---|---|---|
| Mean | 12.29 | 12232. 221 | 17.67 | 30.187 |
| Median | 13.00 | 11543.528.00 | 17.00 | 30.675 |
| Maximum | 20.50 | 29137.800 | 26.38 | 32.270 |
| Minimum | 6.00 | 1347.266 | 14.58 | 25.650 |
| Std. Dev. | 3.19 | 8356.076 | 2.27 | 2.036 |
| Skewness | -0.08 | 0.28 | 2.06 | -1.348 |
| Kurtosis | 3.32 | 1.84 | 7.80 | 3.572 |
| Jarque-Bera | 1.16 | 15.05 | 360.36 | 3.796 |
| Probability | 0.56 | 0.00 | 0.00 | 0.150 |
| Observations | 216.00 | 216.00 | 216.00 | 362.240 |

**Source:** Researcher's computation, 2024

The main components of the lending interest rate (LINT) and the short-term interest rate indicator (SINT) are displayed in Table 2. According to the findings, the first component (CIROTD7) explains 93% of the variance in the five short-term interest rates, with the

remaining four components explaining only 7% of the variance. In a similar vein, the first component (PLR) becomes the dominant component of the two lending interest rates.

**Table 2:** Principal components analysis (PCA) result

| Component | Eigenvalue | Proportion | Cumulative |
|---|---|---|---|
| SINT | | | |
| CIROTD7 | 4.683 | 0.937 | 0.937 |
| CIROTD2 | 0.205 | 0.041 | 0.978 |
| CIROTD3 | 0.071 | 0.014 | 0.992 |
| CIROTD6 | 0.032 | 0.006 | 0.998 |
| CIROTD12 | 0.009 | 0.002 | 1.000 |
| LINT | | | |
| PLR | 1.208 | 0.604 | 0.604 |
| MLR | 0.792 | 0.396 | 1.000 |

**Source:** Researcher's computation, 2024

Table 3 presents the series' stationarity properties using the Augmented-Dickey method Fuller and Philip-Peron tests. It shows that the series is stationary only at first difference in both tests. The ARDL model is well suited for series-containing models of this stationarity feature (Pesanran et al. 2001). Hence, the ARDL model is adopted for the study.

**Table 3:** Unit root test

| variables | ADF | | PP | | I(d) |
|---|---|---|---|---|---|
| | levels | first diff | levels | first diff | |
| SINT | -3.038 | -16.894*** | -3.003 | -16.817*** | I(1) |
| M2 | -2.742 | -16.506*** | -2.518 | -16.751*** | I(1) |
| MPR | -2.266 | -14.556*** | -2.266 | -14.556*** | I(1) |
| LINT | -3.541** | -14.947*** | -3.932*** | -15.042*** | I(0) |

***, **, * denote significance at 1%, 5%, and 10% respectively.
**Source:** Researcher's computation, 2024

Table 4 is the correlation matrix for the variables in the model. It shows that there is a correlation 1. There is a relationship between short-term interest rates (SINT), lending interest rates (LINT), and money. The supply (M2) and monetary policy rate (MPR) are relatively low, so they can be combined into the same model without generating a spurious result.

**Table 4:** Correlation matrix

| Variables | SINT | MPR | M2 | LINT |
|---|---|---|---|---|
| SINT | 1 | | | |
| MPR | 0.555 (0.000) | 1 | | |
| M2 | -0.499 (0.000) | -0.076 (0.266) | 1 | |
| LINT | -0.109 (0.000) | 0.449 (0.000) | 0.705 (0.000) | 1 |

**Source:** Researcher's computation, 2024

Note: (i) The values in parenthesis are probability values; (ii) because of the possibility of multicollinearity, we were unable to include more variables in the model due to the high correlation we found between these variables and the other independent variables. As a result, we eliminated them from the study to prevent erroneous regression results (see Table A1 in the appendix).

The bound test findings are displayed in Table 5 and indicate if there is a long-run relationship between the two models. At the five percent significance level, the F-statistics are greater than the upper bound critical value. The investigation comes to the conclusion that there is a long-term relationship between the variables as a result of rejecting the null hypothesis that there isn't one

**Table 5:** Bound test – Null Hypothesis: No long-run relationship

| Test Statistic | Value | Significance | I(0) | I(1) |
|---|---|---|---|---|
| Dependent Variable: SINT | | | | |
| F-statistic | 4.2495 | 10% | 2.63 | 3.35 |
| k | 2 | 5% | 3.1 | 3.87 |
| | | 2.50% | 3.55 | 4.38 |
| | | 1% | 4.13 | 5 |
| Dependent Variable: LINT | | | | |
| F-statistic | 4.549 | 10% | 2.37 | 3.2 |
| k | 3 | 5% | 2.79 | 3.67 |
| | | 2.50% | 3.15 | 4.08 |
| | | 1% | 3.65 | 4.66 |

**Source:** Researcher's computation, 2024

Table 6 displays the threshold regression results, which also highlights a significant turning point in the relationship between MPR, the lending interest rate (LINT), and the short-term interest rate (SINT). The model sets the threshold at 11 and 13 percent, respectively. The degree of MPR's impact on the short-term interest rate is now seen to be shifting. MPR below the 11 percent cutoff has a 0.3 percent impact on SINT. In other words, at these levels, a percentage increase in MPR is predicted to raise SINT by 0.3 percent, indicating that MPR has a partial impact on SINT.

In the case of LINT, the effect is insignificant. MPR below the 13 percent cutoff has a 0.0 percent influence on LINT. In other words, at current levels, a percentage increase in MPR is predicted to result in a 0.0 percent increase in LINT, basically indicating that MPR has no influence on LINT. Conversely, if MPR exceeds the 11 percent threshold, it has a 0.65 percent impact on SINT. In this regime, a percentage point increase in MPR results in a 0.65 percent increase in SINT. Because the coefficient of MPR in this regime is less than unity, the pass-through is insufficient. Similarly, MPR exceeding the 13 percent cut off affects LINT by 0.51%. In this regime, a percentage point increase in MPR results in a 0.51 percent increase in LINT. Because the coefficient of MPR in this regime is less than unity, the pass-through is

insufficient. However, the effect is more pronounced and meaningful when compared to the alternative regime.

Furthermore, for the short-term and loan interest rate models, respectively, the degree of the MPR regime's effect above the 11 and 13 percent barrier surpasses the size of the effect when the MPR regime is below these thresholds. The findings therefore suggest price stickiness below the threshold, with the degree of stickiness varying according to the SINT or LINT market interest rate being studied. Furthermore, the MPR threshold for LINT is larger than that of SINT, suggesting that at lower MPR levels, lending rates are considerably less responsive to MPR than deposit rates. However, in comparison, SINT and LINT react to MPR rates that are higher than their respective thresholds.

These findings have policy implications because they suggest that MPR can be critical to the CBN's goal of price stabilization. This is due to the fact that a higher MPR translates into a higher SINT, which raises the cost of keeping money and may indicate a decrease in overall economic liquidity, both of which have an impact on the level of aggregate prices. The findings also suggest that the monetary authority has limited leeway to lower lending rates in the economy by utilizing the MPR. Changes in the loan rate are generally unaffected by MPR rates lower than 13 percent.

**Table 6:** Threshold regression result

| Dependent Variable | SINT | | LINT | |
|---|---|---|---|---|
| | regime 1 | regime 2 | regime 1 | regime 2 |
| | (MPR < $\lambda$) | MPR≥ $\lambda$ | MPR < $\lambda$ | MPR ≥ $\lambda$ |
| MPR | 0.300 | 0.651*** | 0.000 | 0.513*** |
| LOG(M2) | -2.034*** | -0.601*** | 1.398*** | 1.062*** |
| C | 29.745*** | 0.9402 | -2.307*** | -2.384*** |
| Identification of thresholds | | | | |
| $\lambda$ | 11 | | 13 | |
| Other diagnostics | | | | |
| R-sqr | 0.64 | | 0.89 | |
| adj. R-sqr | 0.64 | | 0.89 | |
| F-stat | 75.89*** | | 374.61*** | |

N.B ***, **, * denote significance at 1%, 5%, and 10% respectively
**Source:** Researcher's computation 2024

Table 7 illustrates the asymmetric impacts of MPR and money supply (M2) on SINT and LINT. The regression's findings show that SINT and LINT are only partially affected by changes in the MPR, both positive and negative. A decrease in MPR results in a minor reduction in SINT, whereas an increase in MPR raises the short-term interest rate significantly. SINT increases by approximately 0.13 percent for every percentage increase in MPR. Furthermore, a drop in MPR lowers SINT by 0.06 percent, which is minimal. Conversely, a fall in MPR results in a considerable reduction in LINT, while an increase in

MPR very slightly and insignificantly raises the lending interest rate. For every percentage increase in MPR, about 0.01 percent more LINT is produced. Furthermore, even when LINT is only reduced by 0.04 percent, a drop in MPR has a considerable impact.

The non-linear effects of MPR on SINT and LINT were theoretically expected; however, MPR has a statistically non-significant negative effect on SINT and a statistically significant positive effect on LINT. Mordi et al. (2019) could only demonstrate the potential for disparities in the retail rate adjustment process (savings rate in particular) in response to MPR changes. Nonetheless, this study's conclusions show that there is a non-linear influence on lending and short-term interest rates. The significant impact of a negative shift in MPR on lending rates is noteworthy. Nigerian practical experience indicates that prices are downwardly sticky. In fact, a tiny coefficient of the negate MPR change supports this sensation. The "small" effect is nonetheless noteworthy. The results of the principal component analysis indicate that prime lending rates are higher than maximum lending rates, which may help to explain this. Since the majority of credit borrowers in Nigeria employ the prime lending rate, these borrowers really have significant bargaining power to negotiate a reduction in lending rates in reaction to a decline in the MPR because of their sheer dominance in the borrowers' market.

Additionally, the theoretical literature suggested that prices could be sticky downward, which would account for the possibility that SINT would not be significantly impacted by a downward revision in MPR in this particular instance. These distortions occur in Nigeria as a result of oligopolistic behavior, asymmetric information, and high switching costs. A lack of consumer creditworthiness data contributes to asymmetry by making it difficult for banks to determine customers' risk profiles and, consequently, lending amounts (Sanusi, 2010). The absence of feasible alternatives for depositors to replace their bank savings gives rise to switching costs. The collusive actions of the few institutions that control the majority of the banking sector further strengthen this cost. Banks' pursuit of short-term profits contributes to this by shortening the banking system's liquidity cycle and limiting the opportunities for long-term lending and genuine investments (Tule, 2014; Itaman & Awopegba, 2021). Regarding the model's goodness of fit, the adjusted R-squared indicates that around 93% of the variation in SINT can be explained by both positive and negative changes in the money supply and MPR. The Durbin-Watson test proves that there is no serial correlation in the model, and the F-statistic validates the parameters' joint significance.

**Table 7:** NARDL model result

| Variable | SINT<br>Coefficient (S.E) P-value | LINT<br>Coefficient (S.E) P-value |
|---|---|---|
| MPR POS | 0.135 (0.063)** | 0.013 (0.009) |
| MPR NEG | -0.061 (0.039) | -0.042 (0.022)* |
| log(M2) | -0.022 (0.01) ** | 0.112 (0.200) |
| C | 0.116 (0.072) | -0.612 (1.223) |
| R-squared | 0.933 | 0.982 |
| Adjusted R-squared | 0.930 | 0.981 |
| S.E. of regression | 0.250 | 0.136 |
| Sum squared resid | 12.636 | 3.405 |
| Log likelihood | -1.888 | 116.870 |
| F-statistic | 314.240 | 1117.601 |
| Prob(F-statistic) | 0.000 | 0.000 |
| Durbin-Watson stat | 2.034 | 2.210 |

N.B ***, **, * denote significance at 1%, 5%, and 10% respectively
**Source:** Researcher's computation 2024

## Conclusion and Recommendations

This research investigates the impact of MPR on Nigeria's market interest rates. The precise goals come in two different shapes. We looked at the nonlinear link between MPR and other market rates first, and then we looked into the point at which this influence becomes noticeable. The short-term interest rate (SINT) and the lending interest rate (LINT) were developed as two relevant measures.

To accomplish the two goals of the investigation, we used threshold regression and nonlinear ARDL models. According to the Monti-Klein theoretical paradigm, a complete effect cannot be deduced until the coefficient indicating MPR is unity. In both models, the estimates were less than one, suggesting that MPR has a partial impact on lending and short-term interest rates. These findings support the widely accepted literature that MPR in Nigeria does not fully flow through to interest rates.

Furthermore, the MPR threshold for SINT and LINT was determined using the threshold regression model to be 11 and 13 percent, respectively. According to the model's results, MPR has a bigger impact on SINT and LINT when it is above the anticipated threshold than when it is below it. The findings suggest that price stickiness is below the threshold, with the degree of stickiness varying depending on the SINT or LINT market interest rate being studied. Additionally, the non-linear ARDL model's results demonstrate that, while the opposite effect also exists, rising MPR has a favorable impact on lending and short-term interest rates. The results show overall downward stickiness in pricing; theoretically, a fall in MPR should cause a decrease in SINT and LINT, but the amount of the decrease for LINT is small, and the effect for SINT is statistically negligible.

The monetary policy rate is becoming a more significant tool, especially in an economy that has seen an increase in the frequency of economic crises since the 2008 global financial crisis. The study's conclusions provide specific insights into the anticipated effects of changes in the policy rate and have significant implications for the use of monetary policy for either

contractionary or expansionary goals. Furthermore, MPR's inefficiency as a tool for monetary policy is only true when it is changed downward. Reducing the policy rate is unlikely to impact other market rates; this is especially true below a certain threshold, perhaps 11 or 13 percent, depending on the particular interest rate market. In order to increase the efficacy of monetary policy, we suggest that the monetary authorities concentrate on banking sector reforms that eliminate downward rigidities in the impact of MPR on market rates. This recommendation is based on our study's findings. A reform that could result in more competitive practices and more efficient financial institutions would be to expand the number of banks or decrease their size.

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# Terrorism and Economic Growth in West Africa: Analysing the Impact of Insecurity on Development

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**Abstract**

The rising incidence of terrorism, particularly in West Africa, has become a significant concern, adversely affecting economic activities in the region. This research aims to assess the Impact of terrorism on economic growth in ECOWAS countries by augmenting the Solow model to incorporate terrorism as a distinctive country characteristic. Employing dynamic and systematic Generalized Method of Moments (GMM) techniques, the study reveals that terrorism negatively affects economic growth, with short-run and long-run reductions estimated at 2.83% and 1.35%, respectively. While the long-term impact is less severe than the short-term, both results indicate a detrimental effect on growth. The findings underscore the urgent need for strategic interventions to combat terrorism and its adverse economic implications, emphasising the importance of collaborative efforts to enhance regional security and stability.

**Keywords:** *Terrorism, Economic Growth, West Africa*

**Background to the Study**

Terrorism has become a pervasive global issue, with its frequency and intensity escalating in recent years. The United Nations defines terrorism as any act aimed at causing death or severe harm to civilians or non-combatants to intimidate a population or pressure a government to act or refrain from acting. In West Africa, terrorism has manifested through violent attacks on civilians, kidnappings, and the destruction of property, often driven by political, religious, or ethnic motivations. Scholars have approached the subject of terrorism from various perspectives, with different definitions emerging over time (Bolaji, 2010; Hoffman, 1998; Hutchinson & O'Mallery, 2007; Wardlaw, 1982; Warren, 2012; Toros, 2008). However, the underlying objective of terrorism remains consistent: exerting political and economic pressure on governments to fulfil the demands of terrorist groups. In response, the Economic Community of West African States (ECOWAS) has adopted a regional counter-terrorism strategy aimed at supporting member states in their fight against terrorism and eradicating terrorist activities (Bolaji, 2010). The complexity of terrorism in West Africa is further compounded by ethnic and religious fractionalisation, economic deprivation, and the limited capacity of many developing economies to counter increasingly sophisticated terrorist operations (Omuoha, 2013).

The economic impacts of terrorism in West Africa are far-reaching. Firstly, terrorism directly undermines economic growth by destroying human and physical capital. The destruction caused by terrorist attacks can lead to significant losses in vital economic sectors, including infrastructure, agriculture, and commerce. Secondly, terrorism prompts governments to increase counter-terrorism spending, diverting resources from productive sectors to defence, which yields less economic output. Additionally, terrorism creates widespread uncertainty and risk, influencing individuals' savings, investments, and consumption patterns, often causing a decline in overall economic activity. Foreign direct investment (FDI), a critical driver of economic growth in developing countries, is frequently diverted away from nations with high terrorism risks to more stable environments. A World Bank study recently highlighted the redirection of FDI within West Africa due to such risks. Finally, terrorism severely affects critical sectors like tourism and financial markets, as uncertainty and security concerns deter international visitors and investors (Nkwi, 2013). Studies such as Qamar (2021) and Mathiyalagan and Padli (2022) confirm the negative correlation between terrorism, FDI, and economic growth while showing the variations in its impacts across regions.

Despite the growing body of research on terrorism, many studies focus on the number of terrorist incidents without considering the broader and more nuanced impacts of terrorism on economies. One tool that offers a more comprehensive measure is the Global Terrorism Index (GTI), which provides a detailed summary of terrorism trends and their effects on countries worldwide. Unlike the mere count of terrorist events, the GTI measures the direct and indirect Impact of terrorism, including lives lost, injuries, property damage, and psychological effects. It ranks countries on a scale from 0 to 10, with 10 representing the highest Impact. Studies by Bardwell and Iqbal (2021) and Ruiz Estrada et al. (2018) demonstrate the usefulness of the GTI in quantifying the global and regional economic impacts of terrorism. This paper

employs the Global Terrorism Index to analyse terrorism's Impact in West Africa, providing a more holistic view of how terrorism has shaped the region's economic and social landscape over time.

The primary objective of this research is to examine the direct and indirect effects of terrorism on economic growth and development in selected West African countries. By analysing key economic indicators such as GDP, trade, savings, FDI, population growth, and education, this study provides a detailed understanding of the long-term implications of terrorism on the region's development. A novel economic model, the Generalized Method of Moments (GMM), is employed to analyse the data from 2007 to 2021. This method allows for the efficient estimation of the model's parameters while addressing the potential endogeneity issues that often arise in time-series data, offering more robust insights into the relationships between terrorism and economic outcomes. Safdar (2020) provides an example of using advanced econometric techniques such as the ARDL model to analyse the economic impacts of terrorism, further supporting the relevance of dynamic models like GMM in this context.

The structure of this paper is as follows: The first section introduces the research, outlining the motivation and significance of studying the economic impacts of terrorism in West Africa. The second section provides a comprehensive literature review, presenting various scholars' perspectives on terrorism and its effects on development. The third section outlines the research methodology, explaining the choice of the GMM model and detailing the data sources. The fourth section presents the data and interprets the results, highlighting key findings on the Impact of terrorism on the selected economic indicators. The final section concludes the paper by offering policy recommendations to mitigate the adverse effects of terrorism on West Africa's economic development.

**Literature Review**

Several studies have examined the Impact of terrorism on economic growth, Foreign Direct Investment (FDI), and employment, revealing consistent findings about its detrimental effects. Qamar (2021) explored the relationship between terrorism, tourism, and economic growth, focusing on GDP, FDI, and employment in a study spanning from 2003 to 2019. The results showed a long-run relationship between terrorism, GDP, and FDI but no significant connection with employment. Similarly, Mathiyalagan and Padli (2022) investigated the effects of terrorism on GDP and FDI in Malaysia, Indonesia, and the Philippines, finding a negative impact on both variables. Iheonu and Ichoku (2021) studied African countries and highlighted that military expenditure could partially mitigate the adverse effects of terrorism on economic growth. While terrorism generally decreases economic growth, military expenditure may reduce this negative effect under certain circumstances.

Bardwell and Iqbal (2021) estimated the global economic cost of terrorism to be $855 billion between 2000 and 2018, with the highest annual impact occurring in 2014 at $111 billion. Their research showed that terrorism-related deaths and injuries have severe economic consequences, peaking between 2011 and 2014. Ruiz Estrada et al. (2018) applied a vulnerability evaluation model to assess terrorism's Impact on Turkey's economy, focusing on

long-term economic degradation caused by terrorist attacks. Safdar (2020) provided insights into the Pakistani economy, showing that increased terrorist activity leads to a significant reduction in economic growth, both in the short and long term, using an Autoregressive Distributed Lag (ARDL) model. Though conducted in different regions, these studies consistently highlight the negative relationship between terrorism, economic growth, and FDI.

Beyond direct economic implications, other literature has explored the underlying factors contributing to terrorism and its socio-economic effects. Piazza (2006) argued that poverty, inequality, unemployment, and poor economic development are significant drivers of terrorism. Brockhoff et al. (2012), using data from 133 countries between 1984 and 2007, demonstrated that lower education levels are associated with higher domestic terrorism, especially under adverse socio-political conditions. Oyefusi (2010) found that high unemployment, particularly among educated individuals, increases the likelihood of their involvement in violent activities. Araz-Takay et al. (2009) examined the non-linear relationship between political conflict and economic activity, concluding that terrorism's Impact on economic performance is more severe during periods of economic expansion. Eckstein and Tsiddon (2004) and Naor (2006) further noted that terrorism raises the perceived risk of early death, leading individuals to prioritise current consumption over future savings, exacerbating economic decline. Azam and Thelen (2008) emphasised that higher secondary education enrollment can help reduce domestic terrorism.

## Methodological Notes

### Theoretical Background

The Neoclassical Growth model, introduced by Robert Solow and Trevor Swan in the 1950s, explains that several key factors influence GDP growth. First, a higher proportion of GDP allocated to investment increases growth. Conversely, a higher depreciation rate of physical capital reduces growth, while technological advancements or total factor productivity accelerates it. A central assumption of the model is that technological progress occurs externally (exogenously) and is uniform across countries. Known for employing the Cobb-Douglas production function, the model also makes three fundamental assumptions: the labour force grows at a constant rate, all savings are fully invested (implying that saving (S), investment (I), and the savings rate (sY) are equal), and output (Y) is produced through the interaction of capital and labour.

$$Y = F(K, L) \quad (1)$$

The production function $Y = F(K, L)$ in the Neoclassical Growth Model reflects constant returns to scale and diminishing returns to the variable factor when other factors are held constant (Mankiw, 2003). The model suggests that economic growth is steady when capital per worker and investment requirements are balanced. It highlights that increasing labour supply or capital investment (physical or human) enhances productivity. Technological change, a critical factor in productivity and capital accumulation, is crucial for labour productivity growth.

Criticisms of the model focus on its assumptions. It assumes perfect competition, where equilibrium ensures efficient resource allocation, but market failures lead to uncertainty and imperfect information, destabilising expectations and reducing investments. The model introduces technological change only at the steady state, assuming it to be neutral and exogenous, which limits its discussion on how technology evolves. Furthermore, Stonier and Hague (1975) criticise the model's assumption that technology is universally available and exogenously determined, arguing that it should be considered tradable and endogenously determined for long-term economic growth.

In analysing the effect of terrorism on economic growth in ECOWAS countries, a suitable growth model must incorporate foreign investment and trade. Thus, the Solow model, augmented by Mankiw et al. (1992) and further modified by Buss and Koniger (2012), is essential, leading to the following functional framework:

$$lny_t - lny_0 = -\left(1 - e^{-\lambda t}\right)lny_0 + \left(1 - e^{-\lambda t}\right)lnA_t + \left(1 - e^{-\lambda t}\right)\frac{\alpha}{1-\alpha-\beta}lns_k$$
$$+\left(1 - e^{-\lambda t}\right)\frac{\alpha}{1-\alpha-\beta}lns_h - \left(1 - e^{-\lambda t}\right)\frac{\alpha+\beta}{1-\alpha-\beta}ln(n + g + \delta) \qquad (2)$$

Where growth is measured as the difference between the natural logarithm of output per worker in period t and its original or initial value $lny_t - lny_0$ which is said to be the function of the following factors:

$A_t$ = the level of technology
g = rate of technology progress
$y_0$ = initial output per work
$s_k$ = saving rate
α/β = the share of capital/human capital in output
λ = the rate of convergence to steady state
δ = depreciation rate
n = the growth rate of the labour force
$s_h$ = investment in human capital

Given that output and technological levels are not similar in every country, Mankiw et al. (1992) further assumed that the level of technology at any given period is subject to each country's initial level of technology $A_0$ while the rate of technology remains constant across all nations. Thus;

$$A_t = A_0 e^{gt} \qquad (3)$$

In developing nations such as those in ECOWAS, the assumption of uniform technology growth is inadequate (Buss and Koniger, 2012). They argue that the dissemination of globally available technology depends on country-specific factors. International trade and foreign direct investment (FDI) are critical channels for exchanging ideas across borders, influenced by the level of terrorism in these nations. Therefore, bilateral trade, FDI, and terrorism levels

are crucial determinants in the variation of technology dissemination across countries. Solow (2007) previously noted that "nearly everyone assumes the growth rate of total factor productivity (TFP) is uniform globally," based on the idea that knowledge of new technology spreads quickly worldwide. However, Solow emphasised that productivity depends on several factors beyond the availability of new technology, including other country-specific conditions, highlighting the importance of adapting growth models to reflect these dynamics. To represent all these factors, a different assumption on the country-specific development on the level of technology $A_{it}$ become appropriate;

$$A_{it} = A_0 e^{gt} e^{\phi_j X_{ij}} \tag{4}$$

$X_{ij,}$ in general, captures both bilateral trades, FDI and terrorism index, which could be associated with the development of a technological level of a country and which, according to Gundlach (2002), differs with countries.[1] To insert this latest assumption into the initial augmented Solow model represented by equation (3.2), the following equation results;

$$lny_t - lny_0 = -\left(1 - e^{-\lambda_t}\right) lny_0 + \left(1 - e^{-\lambda_t}\right) lnA_t + \left(1 - e^{-\lambda_t}\right) \frac{\alpha}{1-\alpha-\beta} lns_k + \left(1 - e^{-\lambda_t}\right) \frac{\alpha}{1-\alpha-\beta} lns_h - \left(1 - e^{-\lambda_t}\right) \frac{\alpha+\beta}{1-\alpha-\beta} ln(n+g+\delta) + \left(1 - e^{-\lambda_t}\right) \beta_j X_{ij} \tag{5}$$

In all, this particular model will allow for the amalgamation of the features of the augmented Solow model with more realistic assumptions about a country-specific development of the technology level. These contending country-specific variables are essential in differentiating how economic growth is influenced in different countries.

**Model Specification**

Going by the primary objective of this research work, it is imperative to relay an estimate-able equation drawing from the preceding augmented Solow model, bearing in mind that to accommodate for foreign direct investment, trade and terrorism index with relation to economic growth in ECOWAS during the period 2005- 2017 inclusive. Therefore, the theoretical model, as represented by equation (5), would yield a clear implication for the specification of a testable regression equation as follows:

$$lny_{it} - lny_{it-1} = \beta_0 + \beta_1 lny_{it-1} + \beta_2 lns_{k,it} + \beta_3 lns_{h,it} + \beta_4 \ln(n_{it} + g + \delta) + \beta_j X_{j,it} + \tau_t + n_i + v_i \tag{6}$$

However, the model includes period-specific intercepts ($\tau_t$), accounting for period-specific effects like changes in productivity affecting all countries, and country-specific fixed effects ($n_i$) and an independent and identically distributed error term ($v_i$), which are necessary for panel data set-up.

[1] Gundlach, E. (2005), Solow vs. Solow: Notes on Identification and Interpretation in the Empirics of Growth and Development, Review of World Economics (Weltwirtschaftliches Archiv) 141(3): 541-556.

Since $X_{ijt}$ has three components, which will be required to be segregated as follows:

$$\beta_j X_{ijt} = \beta_5 x_{ijt} + \beta_6 F_{ijt} + \beta_7 T_{ijt} \quad (7)$$

Substituting this into equation (3.6);

$$lny_{it} - lny_{it-1} = \beta_0 + \beta_1 lny_{it-1} + \beta_2 lns_{k,it} + \beta_3 lns_{h,it} + \beta_4 \ln(n_{it} + g + \delta) \beta_5 x_{ijt} + \beta_6 F_{ijt} + \beta_7 T_{ijt} + \tau_t + n_i + v_i \quad (8)$$

The connotation of the variables remains as previously explained, though certain model limitations need addressing. One key issue is the potential endogeneity of the explanatory variables. Additionally, crucial factors like the initial level of technology and country-specific effects are unobservable and, thus, excluded from the analysis.

Following the approach of Mankiw et al. (1992) and Buss and Koniger (2012), the model will incorporate essential control variables from the original Solow model. The saving rate (sk) will be proxied by domestic investment as a percentage of real GDP, while average population growth will represent the labour force growth rate (n). Investment in human capital (sh) is measured by educational expenditure, but both the world technology growth rate (g) and depreciation rate (δ) are assumed constant over time and, therefore, omitted.

This study introduces trade (x), foreign direct investment (F), and terrorism (T) as unique variables. Trade will be measured through trade openness (the share of trade in GDP) using the import-based approach, while FDI is measured by its level, and the terrorism index represents terrorism in each country.

Finally, as the dependent variable, the research will use the growth rates GDP per capita $lny_{it} - lny_{it-1}$ and will subsequently be labelled as $\Delta y_{it}$ while the compulsory lag will be taken as $y_{it-1}$. The regression equation will look as follows:

$$\Delta y_{it} = \beta_0 + \beta_1 y_{it-1} + \beta_2 lns_{k,it} + \beta_3 lns_{h,it} + \beta_4 n_{it} + \beta_5 x_{ijt} + \beta_6 F_{ijt} + \beta_6 T_{ijt} + \varepsilon_t \quad (9)$$

This is the equation that will be estimated.

**Table 1:** Variables and Sources

| Variables | Expectation | Source |
|---|---|---|
| GDP Per Capita growth | Dependent | UNCTAD |
| Trade Openness | +ve | UNCTAD |
| Investment (%GDP) | +ve | WDI-World Bank |
| FDI | +ve | UNCTAD |
| Population Growth | +ve | UNCTAD |
| Terrorism Index | -ve | Institute for Economics and Peace |
| Education Expenditure | +ve | World Bank |

**Source**: Compiled by the author

**Scope and Sources of Data**

This study examines the Impact of terrorism on the economic growth of ECOWAS countries. The research covers 14 years, from 2007 to 2021 inclusive. This period is relevant because it is long enough to get reasonable results from the relevant contending variables for the analyses. The sources of data and their expectation are tabulated in Table 1.

**Estimation Technique**

The analysis method was carefully selected based on the dataset length and the number of countries involved. Following Arellano and Bover (1995) and Blundell and Bond (1998), the study adopts the system generalised method of moments (GMM). This approach corrects for endogeneity by introducing additional instruments, improving efficiency, and ensuring they are exogenous to the fixed effects. It builds a system of two equations: the original and the transformed. Additionally, the method employs orthogonal deviations, minimising data loss by using all available observations, even when there are gaps, except for the last observation in each series. In it all, given the technique of analysis, the transformed model is given as follows;

$$\Delta y_{it} = \beta_0 + \beta_1 \Delta y_{it-1} + \beta_2 ln\Delta s_{k,it} + \beta_3 ln\Delta s_{h,it} + \beta_4 \Delta n_{it} + \beta_5 \Delta x_{ijt} + \beta_6 \Delta F_{ijt} + \beta_6 \Delta T_{ijt} + \Delta \varepsilon_t \quad (9)$$

All variables remain as previously described.

**Table 2:** Descriptive Statistics

| | Mean | sd | min | max |
|---|---|---|---|---|
| Growth | 5.15 | 4.53 | -20.49 | 37.50 |
| Gti | 1.49 | 2.17 | 0.00 | 9.31 |
| open | 0.55 | 0.21 | 0.07 | 1.26 |
| save | 11.16 | 16.79 | -70.26 | 49.90 |
| Edu | 3.98 | 1.53 | 1.03 | 8.14 |
| Popgr | 2.68 | 0.61 | 1.06 | 4.52 |
| Lnfdi | 5.40 | 1.53 | 1.64 | 9.10 |
| N | 210 | | | |

**Source:** Author's computation

**Analysis and Results**

**Descriptive statistics and correlation**

Table 2 presents the summary statistics, while Table 3 displays the correlation coefficients. The study covers 15 ECOWAS countries, yielding 210 observations, with 14 observations per country. The tables provide the variables' mean values, standard deviations, minimum, and maximum values for easy reference. The correlation coefficients reveal that none of the variables are strongly correlated with each other, except in one case: The Global Terrorism Index (GTI) shows a positive correlation with foreign direct investment (FDI) in logarithmic terms. This result is surprising, as terrorism is generally expected to deter foreign investors. Nonetheless, FDI remains suitable as an instrumental variable in the model.

**Table 3:** Correlation

| | growth | Gti | Open | save | Edu | popgr | lnfdi |
|---|---|---|---|---|---|---|---|
| Growth | 1 | | | | | | |
| Gti | 0.0441 | 1 | | | | | |
| Open | 0.202** | -0.405*** | 1 | | | | |
| Save | -0.0436 | 0.240** | -0.331*** | 1 | | | |
| Edu | 0.00930 | -0.226** | 0.370*** | 0.173* | 1 | | |
| Popgr | 0.153 | 0.202** | -0.0808 | -0.119 | -0.0861 | 1 | |
| Lnfdi | 0.246** | 0.503*** | -0.0864 | 0.143 | 0.0329 | -0.0383 | 1 |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Source**: Author's computation

**Short-and Long-run Coefficient Determination**

The regression analysis using System GMM reveals a long-run relationship between terrorism, population growth, and economic growth in the ECOWAS region. As shown in Table 4, two variables are statistically significant. First, terrorism significantly hampers economic growth, with a 1% increase in terrorism leading to a 2.83% reduction in growth in the short run, statistically significant at the 5% level. Terrorism disrupts economic activities by damaging infrastructure, reducing the labor supply, and creating instability, negatively impacting growth. It also deters foreign investment, further stifling progress. In the long run, terrorism continues to have a negative impact, with a 1% increase leading to a 1.35% reduction in growth. This underscores the pervasive effects of terrorism on the region's welfare and economic health.

On the other hand, population growth emerges as a significant positive driver of economic growth. As a proxy for labor supply, population growth supports economic activities and development. In contrast to ageing populations in advanced economies like Japan, where labour shortages are prevalent, the youthful demographic in ECOWAS provides a substantial workforce to propel growth. In the short run, a 1% increase in population growth boosts economic growth by 22.38%, while in the long run, it results in a 9.35% rise. These effects are statistically significant, with the short-run Impact significant at the 5% level and the long-run effect at 1%. This highlights the importance of population dynamics in the region's economic trajectory. Ultimately, the youthful and expanding population of ECOWAS serves as a critical asset for its sustained economic growth.

**Table 4:** sysGMM Results (Dep. Var GDP Growth)

| | Short-run | Long-run |
|---|---|---|
| GTI | -2.830271** (-1.99) | -1.349*** (-1.43) |
| OPEN | 4.328107 (0.22) | |
| SAVE | 13.43415 (0.90) | |
| EDU | 1.143621 (0.72) | |
| POPGR | 22.37795** (1.99) | 9.3475***(1.549) |
| LNFDI | 5.398815 (1.38) | |
| Year Dummy | YES | |
| No of Observation | 163 | |
| F-statistic | 0.057 | |
| Group/Instrument | 15/14 | |
| AR(2) | 0.310 | |
| Hansen Statistic | 1.000 | |

Note: ***, **, * are statistical levels at 1%, 5%, and 10%, respectively; t-statistics in parenthesis are based on white heteroscedasticity-consistent standard error, *p-values* reported for AR (2) and Hansen statistic.

**Source**: Author's computations

Other variables in the model, such as trade openness, saving, and educational expenditure, while positively impacting economic growth, were not statistically significant. This suggests that although they contribute to growth, their effects may not be pronounced within the scope of the current dataset. Given that the GMM approach is better suited for shorter datasets, expanding the sample to include more countries could yield more significant results for these variables.

The stability test revealed that the number of observations was reduced to 168 dues to many zero observations for the terrorism ratio. A year dummy was introduced as a fixed effect to account for unobserved heterogeneity and heteroscedasticity. Additionally, the number of groups exceeded the number of instruments, indicating model stability. The AR and Hansen tests were also insignificant, further confirming the model's stability and supporting the results' reliability. Thus, the current findings can be confidently used to assess the Impact of terrorism on economic growth in the ECOWAS region.

**Discussion of Findings**

The results of this study align with previous literature that emphasises the detrimental effects of terrorism on economic growth. For instance, studies by Mathiyalagan and Padli (2022), Enders and Sandler (2000) and Bandyopadhyay et al. (2011) have shown that terrorism not only disrupts economic activities but also deters foreign direct investment, leading to a slowdown in growth. This study's finding that a 1% increase in terrorism is associated with a 2.83% reduction in short-run economic growth resonates with previous research, indicating that the immediate impacts of terrorist attacks create significant economic disruptions, resulting in a loss of productivity and investment.

Additionally, the long-run implications observed in this study—where a 1% increase in terrorism correlates with a 1.35% decline in economic growth—are consistent with findings from other scholars such as Qamar (2021), Muggah and Krause (2014), who argue that terrorism's prolonged effects can lead to systemic instability and hinder long-term development efforts. Moreover, the negative correlation between terrorism and foreign direct investment supports the work of Ruiz Estrada et al. (2018) and Blomberg et al. (2004), who noted that increased terrorism risk can divert capital from affected regions, further stifling economic growth. These results reinforce the idea that terrorism poses a serious challenge to economic stability, particularly in developing regions like West Africa, where resources are already constrained and the capacity for recovery is limited.

**Conclusions**

This research primarily aims to assess the Impact of terrorism on economic growth within ECOWAS countries. By augmenting the Solow model to incorporate the effects of terrorism, this study highlights how unique country characteristics can influence the region's economic landscape, introducing a novel perspective to the existing economic framework. The findings indicate that terrorism significantly hampers economic growth, with numerical evidence showing reductions of approximately 1.35% in the long run and 2.83% in the short run. Although the long-term impact is less severe than the short term, both effects are negative.

Given the persistent nature of terrorism in the region, the ECOWAS Military Observer Group (ECOMOG) must intensify its efforts in combating this issue. Strengthening regional military alliances is crucial to addressing the escalating threat of terrorism effectively. Furthermore, regional governments should collaborate to enhance intelligence sharing, resource allocation, and training initiatives for security forces to create a more cohesive and robust response against terrorism. Finally, investing in socio-economic development programs can help mitigate the root causes of terrorism, fostering a more stable and resilient environment conducive to sustainable economic growth.

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