



Oil Prices, Agriculture and Industrial Sector Performance in Nigeria

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Abstract

This study employed time series data from 1981 to 2024 to analyse the effects of oil prices and agricultural sector performance on the industrial sector in Nigeria. The annual time series data were sourced from the Central Bank of Nigeria Statistical Bulletin (2024) and the World Bank Development Indicators (2024). A unique emphasis of this study is the decomposition of agricultural output into crop production, livestock, forestry, and fisheries. The researcher utilised a system of dynamic equation modelling for the analysis. Due to the mixed order of integration in the time series data, the Autoregressive Distributed Lag Model (ARDL) was selected as the primary estimation technique. The findings revealed that increases in oil prices, crop production, and fishery production positively influenced Nigeria's industrial output. Conversely, an increase in foreign direct investment was found to decrease industrial output, while a rise in the value of the dollar had a positive effect. The study concluded that agricultural output and practices, particularly crop and fishery production, are significant drivers of industrialisation in Nigeria. These sectors serve as the primary channels through which agricultural productivity impacts industrial growth. Based on these findings, the study recommends that the Nigerian government prioritise agricultural development by promoting the use of machinery in agricultural production and emphasising crop production as the main source of food for the population. Such measures could shift public perception of agriculture and enhance its contribution to industrialisation.



Introduction

It is often acknowledged that agricultural production and crude oil production are critical to national development. Agriculture is a major industry in many emerging economies, but industrial goods are primarily imported from countries with higher levels of technological advancement. The limited ability of these economies to industrially process agricultural commodities prior to consumption, due to low technological development, is a significant concern. As such, this circumstance hampers value addition, job creation, and sustained economic development.

The industrial sector is essential to a country's economic development, as it generates employment, income, and productivity. This sector encompasses a wide range of subsectors, including banking, services, manufacturing, agriculture, mining, and oil and gas. The industrial sector enhances a country's productive capacity, facilitates income distribution, and makes a substantial contribution to exports and GDP as a driver of sustainable growth (Okoye et al., 2016). Its capacity to boost employment, foreign exchange earnings, and economic expansion underscores its vital significance in a nation's developmental trajectory (Onakoya et al., 2012).

In contemporary economies, technological advancements that maximise production efficiency are a major driver of industrialisation. This transition shifts traditional, low-production economies towards high-tech, mass-production systems. Industrialisation involves the deliberate integration of management techniques, technological innovation, and resource optimisation to achieve high levels of productivity (Ayodele & Falokun, 2003). Research indicates that industrial capacity expansion, technological innovation, and enterprise development are the most effective ways to achieve rapid and sustained economic growth (Olamade et al., 2014).

Historically, changes in market dynamics have influenced oil prices. The Organisation of the Petroleum Exporting Countries (OPEC) dominated oil pricing until the mid-1990s. The oil shocks of the 1970s were primarily caused by the 1973 OPEC oil embargo and the 1978 Iranian Revolution. However, since the mid-1990s, the influence of major oil consumers and non-OPEC suppliers has increased, making oil pricing more complex. Rising energy consumption in Asia, particularly in China and India, has driven oil demand, diversifying the global supply landscape (Hamilton, 2013).

Oil plays a central role in Nigeria's economy, with significant socio-political and economic implications. Since the oil boom of the 1970s, Nigeria has prioritised crude oil over agriculture and light manufacturing. In 2011, the oil and gas sector accounted for over 95% of export earnings and nearly 85% of government revenue (Saidu, 2016). Despite its dominance, oil contributed only 14.8% to GDP in 2011, compared to 6% from



the industrial sector and 4% from manufacturing (Adedipe, 2004; Odularu, 2007). The over-reliance on oil has exacerbated "Dutch Disease," causing economic imbalances such as the neglect of agriculture and rural-urban migration.

In emerging nations, agriculture remains a vital engine of economic growth, poverty alleviation, and sustainable development. Agriculture, which provides food, industrial raw materials, and employment opportunities, is widely recognised as a major contributor to economic growth. According to Myrdal (1984), the performance of the agricultural sector is directly linked to long-term economic success. Nigerian agriculture comprises four primary subsectors: crop production, livestock, forestry, and fisheries. Crop production alone accounts for 87.6% of the country's total agricultural output. The sector contributes an average of 24% to GDP and employs over 36% of the workforce (NBS, 2022).

The literature on development economics has long emphasised the importance of agriculture in industrialisation. Agriculture supports industrial growth by providing labour, raw materials, savings, and food required for industrial production. In turn, industrialisation is expected to enhance agricultural productivity through improved infrastructure and inputs. This mutually beneficial interaction between industry and agriculture is crucial for sustainable economic growth (Todaro & Smith, 2011). Nigeria's industrial sector includes construction, manufacturing, water supply, electricity, and mining and quarrying (CBN, 2012). For the purposes of this study, the industrial sector will focus on construction and manufacturing.

Given the critical roles of industry and agriculture in economic growth, this study examines the impact of oil prices on the performance of these sectors in Nigeria. It aims to shed light on how fluctuations in oil prices affect industrial sector performance and agricultural output, thereby informing policy recommendations for resilience and sustainable economic diversification.

1.2 Statement of the Problem

Nigeria's economy, with its heavy reliance on oil and gas, followed by industry and agriculture, exhibits characteristics typical of developing nations. Agriculture continues to play a significant role in the primary sector, which generates more than half of the nation's GDP. However, the dominance of the oil and gas sector—which contributed over 95% of export earnings and nearly 85% of government revenue between 2011 and 2012—has led to a decline in industrial growth and the neglect of agriculture (Chete, Adeoti, & Ogundele, 2016). Conversely, the industrial sector, including mining, manufacturing, and utilities, contributes minimally to economic activity; in 2001, manufacturing accounted for only 4% of GDP. Over the past three decades, Nigeria's



industrial growth has stagnated at less than 5% annually (Nana, 2004), deterring both foreign and private investment in the sector.

Economic growth is a primary objective for emerging nations (Hussain & Khan, 2011). Agriculture is regarded as a key driver of economic growth in many of these economies (Byerlee et al., 2005; Headey et al., 2005; Awokuse, 2008). Theoretical and empirical studies have shown that changes in the agricultural sector can significantly influence overall economic performance (Johnston & Mellor, 1961; Jorgenson, 1961; Chenery & Strout, 1966; Dawson, 2005; Tiffin & Irz, 2006). Nevertheless, the relationship between industry and agriculture remains a subject of ongoing empirical debate.

Nigerian industries largely depend on the oil sector for energy and raw materials, particularly given the unreliable electricity supply from the Power Holding Company of Nigeria. Fluctuations in oil prices have far-reaching economic effects, impacting heating costs, transportation, and the prices of petroleum-derived products. Oil price shocks also create uncertainty, delaying consumer spending and business investment. Furthermore, these shocks necessitate the reallocation of labour and capital between energy-intensive and non-energy-intensive sectors, potentially constraining industrial expansion (Hamilton & Herrera, 2011). Such price volatility can significantly affect macroeconomic indicators, including exchange rates, inflation, unemployment, capacity utilisation, and the money supply (Taiwo, Taiwo, & Olowookere, 2012).

Nigeria has long pursued industrialisation as a means of achieving economic growth, but progress has been slow. Since independence, the government has implemented various industrial policies and reforms, including the Structural Adjustment Programme (SAP), import substitution, export promotion, indigenisation policies, trade and financial liberalisation, and local resource-based strategies (Ekpo, 2014; Okoye et al., 2016). However, due to Nigeria's excessive reliance on oil revenues and external economic shocks, these initiatives have not yielded the desired outcomes.

Despite possessing three large refineries, Nigeria imports refined petroleum products to meet domestic demand. Domestic oil prices have risen steadily since the 1970s due to inefficiencies in the nation's refineries, market manipulation, environmental degradation, and oil theft (Adenikinju, 2012). These issues have caused periodic fuel shortages, with detrimental effects on the economy and environment. The discovery of crude oil has had mixed impacts on agricultural output, particularly in regions near oil extraction sites, where environmental degradation has reduced agricultural productivity and livelihoods.



Several studies have explored the connections between oil prices, industrial performance, and agricultural output. For instance, Sekunmade (2009) found an inverse relationship between oil output and agricultural exports using co-integration and error correction modelling (ECM). Tara (2010) identified a bidirectional short-term causal relationship between oil prices and economic growth. Other studies have examined the impact of oil price volatility on economic indicators (Lee & Ni, 2002; Jiranyakul, 2006; Kumar, 2009; Eksi, Izgi, & Senturk, 2011; Ojapuwa & Ejumedia, 2012; Ahmed, Bashar, & Wadud, 2012; Scholsten & Yurtsever, 2012; Jimenez-Rodriguez & Sanchez, 2012; Aye, Gupta, & Mamba, 2014; Al-Risheq, 2016). However, many of these studies do not account for the significant volatility of oil prices compared to other commodities, due to the inelastic nature of oil supply and demand (Askari & Krichene, 2010; Adams & Marquez, 1984; Hamilton, 2009).

Nigeria's heavy reliance on crude oil revenues, which are highly volatile, has led to revenue instability and increased national debt. This study aims to address gaps in the literature by examining the effects of crude oil prices on industrial sector output and the contribution of agricultural sector performance to industrial growth, considering the broader macroeconomic environment from 1981 to 2022.

The study investigates how oil prices and agricultural output influence Nigeria's industrial sector development. The findings will contribute to the existing literature and provide insights for policymakers, scholars, and researchers. By analysing the relationship between oil prices, agricultural performance, and industrial development, the study will inform policies on investment incentives and subsidies to promote industrialisation. Quarterly time-series data from 1981 to 2022 will be used to capture the effects of oil price fluctuations during periods of booms and downturns. Key variables include oil prices, crop production, livestock, fisheries, forestry, and industrial sector output. Control variables such as exchange rates and private sector credit will be included to provide a comprehensive analysis of sectoral interactions in Nigeria's economy.

While numerous studies have explored the relationship between oil prices and industrial performance, many overlook the broader macroeconomic context, including private sector credit and exchange rates. This study incorporates these factors to provide a more nuanced understanding of how oil price changes affect industrial production in Nigeria. Also, while previous research has examined the separate impacts of agricultural production and oil prices on industrial performance, the combined effect of these factors on industrial growth has not been thoroughly investigated. This study addresses this gap by analysing the interactions between oil prices and agricultural output in Nigeria's oil-dependent economy, offering insights into structural challenges and opportunities for industrial growth.



LITERATURE REVIEW

2.1 Conceptual Clarification

2.1.1 The Concept of Oil Price

Oil prices are determined by global supply and demand, influenced by various supply chain dynamics. The price refers to the spot price of benchmark crude oils, such as West Texas Intermediate (WTI), Brent, and the OPEC Reference Basket, typically measured per barrel (EIA, 2022). As a critical input for manufacturing and energy consumption, crude oil prices significantly affect the cost of petroleum products, oscillate between stability and volatility, and play a vital role in macroeconomic stability (Riaz et al., 2016). In this study, oil prices are defined as global petroleum prices regulated by the Organisation of the Petroleum Exporting Countries (OPEC).

2.1.2 The Concept of Agriculture

According to Okah (2007) and Okafor (2020), agriculture encompasses crop production, animal husbandry, and aquaculture, serving purposes such as food supply, raw material provision, and economic development. It has historically been the foundation of human civilisation and remains essential for employment, poverty reduction, industrialisation, and economic stability. Agriculture contributes to economic growth through the creation of goods and services, supply of raw materials, market expansion, and foreign exchange earnings (Ernest, 2014). For instance, agrarian reforms and government incentives in Brazil enhanced rural productivity, reduced urban migration, and improved overall quality of life (Fasinminn & Bagam, 2009).

2.1.3 The Concept of Industrial Sector Performance

The industrial sector is a crucial component of the economy, encompassing activities related to production, manufacturing, and transportation. Classified as a secondary sector, it primarily serves other businesses rather than direct consumers. Its growth or decline is heavily influenced by supply and demand dynamics in other sectors.

2.1.4 The Manufacturing Industry

The manufacturing sector generates revenue, creates jobs, supplies agricultural inputs, and boosts foreign exchange earnings through exports (Anyanwu, 2012). It includes activities such as manufacturing, mining and quarrying, power generation, construction, and water and gas supply (Ubong, 2022). Industrial capacity, technological innovation, and enterprise development are key drivers of economic growth and sustainable development (Olamade, Oyebisi, & Olabode, 2014). The sector involves the production and processing of goods, either through value addition or the creation of new products (Adebayo, 2010). In developed nations, manufacturing constitutes a significant portion



of the industrial sector (Dickson, 2010). It enhances productivity, export growth, import substitution, job creation, and per capita income (Loto, 2012).

Manufacturing transforms raw materials into finished goods, making it a vital economic engine (Mbelede, 2012). It diversifies the economy, supports agriculture, and generates foreign exchange earnings (Charles, 2012). According to Kaldor (1966), manufacturing drives economic growth through increasing returns, unlike sectors like agriculture and services, which often experience diminishing returns. The sector's growth attracts labour from less productive industries, boosting overall productivity (Pacheco-López & Thirlwall, 2013). Libanio (2006) describes the industrial sector as a growth engine, aligning with Kaldor's first law. Manufacturing involves large-scale production using tools, machines, labour, and chemical or biological processes, ranging from traditional handicrafts to advanced technologies (Adofu, Taiga, & Tijani, 2015).

2.1.5 The Construction Industry

The construction industry is defined by the nature of its projects and the characteristics of its outputs (Ofori, 1990). It encompasses activities related to the erection and maintenance of immobile structures and facilities (Nam & Tatum, 1989), involving interconnected commercial activities (Lang & Mills, 1979; Ofori, 1990). The industry includes suppliers, contractors, and other stakeholders (Hillebrandt, 1984). In the UK, it comprises resources, operations, and financial transactions associated with infrastructure and building materials (Ofori, 1990). Although dominated by small enterprises, the sector significantly contributes to national GDP (Paulson et al., 1975). The South African Department of National Treasury (2012) defines it as a collection of industries collaborating to create and manage fixed assets, involving equipment manufacturers, designers, material suppliers, and public and private stakeholders (Paulson et al., 1975). Its complexity arises from diverse participants and interconnected activities (Ofori, 1990).

According to the International Standard Industrial Classification, construction includes building construction, modification, repair, and demolition; infrastructure development and maintenance (e.g., roads, bridges, sewers, airports); and specialised trade services (e.g., plumbing, electrical wiring, heating systems) (Ofori, 1990). This definition encompasses businesses engaged in mechanical, electrical, and civil engineering projects for both new and existing structures.

2.1.6 Industrial Performance and Oil Prices

Oil price fluctuations impact the manufacturing industry in two ways. Lower oil prices reduce production costs, particularly in energy-intensive sectors like petrochemicals, boosting output. Conversely, higher oil prices increase production costs, potentially hindering industrial growth. These dual effects are highlighted in various studies.

2.1.7 Industrial Performance and Agriculture

Agriculture plays a critical role in industrial performance by supplying raw materials for sectors such as chemicals, polymers, textiles, and lubricants. The use of natural fibres reduces reliance on synthetic materials, freeing up fossil hydrocarbons for energy use. However, in many developing nations, weak linkages between agriculture and industry hinder agricultural modernisation (Abdelmalki & Mundler, 1995). Shifa (2011) found a positive correlation between agricultural GDP contribution and industrial growth. According to Mellor (1966), agricultural development facilitates structural economic transformation, enabling a shift from agrarian to industrial economies. However, classical economic theories argue that while agriculture is essential for industrial development, its lower per capita value-added limits its capacity to drive robust economic growth independently (Lewis, 1954).

2.2 Theoretical literature

2.2.1 The Invisible Hand Theory of Oil Price

Adam Smith (1776) introduced the invisible hand theory, which posits that in a free market, self-interested individuals inadvertently maximise societal benefits. The theory argues that free markets, by achieving economic efficiency without intervention, produce greater benefits than regulated economies. In the context of oil prices, the theory suggests that excess supply and reduced demand lead to price declines until production adjustments restore market equilibrium (Olofin & Iyaniwura, 1983). For instance, when OPEC and non-OPEC countries like the United States and Russia increase output, or when crude oil alternatives proliferate, prices fall until market forces correct the imbalance. Although prolonged recessions may delay recovery, this process typically stabilises within 60–90 days.

Despite its popularity, the theory faces criticism. Keynesian economists argue that free markets are inefficient at self-correction, particularly during recessions, and advocate for government intervention to stimulate demand through increased public spending. Boyce (2020) highlights human irrationality, especially in financial markets, where speculation can lead to asset bubbles and crashes. Proponents of the invisible hand, such as Blaug (1982), Akpakpan (1991), and Bhati (1978), counter that market forces inherently regulate pricing and production, ensuring economic efficiency and wealth distribution. They argue that self-interested firms ultimately contribute to societal welfare.

However, relying solely on the invisible hand to stabilise oil prices may be impractical, as unmanaged supply fluctuations can destabilise financial markets. In capitalist systems, profit-driven firms may exacerbate prolonged downturns and economic instability if left unchecked.

2.2.3 Theory of Predatory Pricing in the Oil Sector

Predatory pricing, formally theorised by North Douglass in 1981, involves a dominant firm deliberately lowering prices to loss-making levels to force competitors out of the market. Once competition is reduced, the firm raises prices to monopoly levels to recoup losses and maximise long-term profits. This strategy differs from competitive pricing, as it relies on eliminating rivals to achieve market dominance.

In the oil industry, predatory pricing is often seen as economically irrational and disruptive. OPEC member states have been accused of overproducing oil to maintain long-term market dominance, forcing smaller producers, particularly independent US firms, out of the market. This tactic has led to the bankruptcy of over forty independent oil companies in the US, with losses amounting to tens of billions of dollars (Sidak, 1983). Critics, including Thomas (1997), Sidak (1983), Sowell (1999), Demsetz (1997), and D'Iorio (1997), argue that predatory pricing is often ineffective. They contend that the dominant firm must eventually raise prices to recover losses, but the duration of the loss-making period is unpredictable. Prolonged losses can erode investor confidence and stock prices, further weakening the firm's financial position. Also, even if competitors exit the market, new entrants can acquire their assets and re-establish competition (Sidak, 1983).

Predatory pricing is widely regarded as anti-competitive and is illegal in many jurisdictions. The Corporate Finance Institute (2019) notes that deliberately lowering prices to eliminate competitors is unsustainable and often prohibited. Recent developments, such as Saudi Arabia's call for non-OPEC members to cut production, highlight the diminishing influence of OPEC due to competition from new producers using cost-effective technologies. Proponents of the theory, such as Burton (1998), Areeda and Turner (1975), and Richard and William (1996), argue that predatory pricing is rare and speculative. They suggest that laws prohibiting it may inadvertently stifle competition. Empirical evidence shows that predatory pricing has occasionally spurred innovation and cost-cutting, as seen in Herbert Dow's successful development of a cheaper bromine production method after a predatory pricing attempt by the German cartel Bromkonvention (Perrings & Ansuategi, 2000).

This study aligns with critics of predatory pricing, arguing that competition, natural market forces, and strategic state intervention provide a more sustainable framework for

oil price stability. Allowing predatory pricing could negatively impact Nigeria's financial market.

2.2.4 Game Theory Strategy

Game theory, developed by Oskar Morgenstern and John von Neumann in the 1940s, is a mathematical framework for strategic decision-making in competitive settings (Brodley & Hay, 1981). It examines how individuals or organisations make decisions to achieve optimal outcomes, focusing on three key elements: players (e.g., firms or consumers), strategies (decisions based on anticipated actions of others), and payoffs (e.g., profit, loss, or market share). These components are fundamental to economic interactions, making game theory widely applicable in business economics.

In the oil sector, game theory explains how interdependent firms behave under uncertainty. The prisoner's dilemma, where individual producers act in self-interest to maximise profits, often mirrors crude oil pricing dynamics. While such behaviour may yield short-term gains, it can ultimately harm all players. For example, when oil prices rise, OPEC members are tempted to increase production for higher revenues. However, this often creates opportunities for non-OPEC producers to boost output, leading to oversupply and subsequent price declines (Mead, 1979; Nenubari et al., 2020).

Proponents of game theory argue that rising oil prices incentivise producers, including OPEC members, to cheat on production quotas (Pu-Yan et al., 2014; Arouri & Rault, 2009; Aloui & Jammazi, 2012; Maghyereh & Al-Kandari, 2014; Arouri & Fouquau, 2009; Jouini, 2013). Higher prices encourage increased extraction, deeper wells, and improved engineering techniques, raising overall supply. According to game theory, the dominant strategy during price surges is to maximise short-term gains by increasing production, regardless of other players' actions. However, this collective behaviour often leads to oversupply, outpacing demand and causing price crashes (Mossavar-Rahmani & Denton, 1977).

2.2.4.1 Game Theory Criticism

While game theory provides valuable insights, it has limitations in predicting real-world behaviour. Critics (Mead, 1979; Mossavar-Rahmani & Denton, 1977; Scheve, 2021) argue that unforeseen factors, such as geopolitical events, external shocks, and irrational decision-making, complicate strategic interactions. Game theory assumes rational, self-interested behaviour, but cooperative strategies, government interventions, and political considerations often influence outcomes in the oil sector. For instance, the prisoner's dilemma framework, which assumes self-interest dominates, may not account for negotiated agreements or sustained partnerships.

In oil-dependent economies like Nigeria, price volatility driven by producers' strategic decisions can significantly impact government revenue, currency stability, and economic growth. While game theory offers a useful framework for understanding oil price dynamics, its assumptions of predictable behaviour and rational self-interest may not fully capture the complexities of global oil markets. Excessive price volatility, driven by producers' focus on short-term gains, may necessitate government intervention and market regulation to ensure long-term stability.

2.3 Empirical Literature

Jiranyakul (2006) employed the Johansen cointegration technique to analyse the impact of global oil prices on Thailand's industrial production. Using monthly data from 1990 to 2004, the study found that oil prices had a significant and positive long-term effect on industrial output. Papapetrou (2009) examined the asymmetric effects of oil price fluctuations on Greece's industrial production between January 1982 and August 2008. Utilising a threshold model (TA-R) and a regime-switching model (RS-R), the study revealed that industrial production declined when oil prices increased by more than 3% monthly.

Mehrara and Sarem (2009) investigated the impact of oil prices on industrial production in Saudi Arabia, Indonesia, and Iran from 1970 to 2005. Using Granger causality and Gregory-Hansen cointegration techniques, they found that Saudi Arabia and Iran were significantly affected by oil price shocks, while Indonesia's industrial production was less impacted. Ojapinwa and Ejumedia (2012) analysed the industrial impact of oil price determinants in Nigeria from 1970 to 2010 using a VAR impulse response approach. The results indicated that industrial production was negatively correlated with inflation and oil prices but positively correlated with the exchange rate.

Scholtens and Yurtsever (2012) used multivariate regression and VAR models to study 38 European firms between 1983 and 2007. Wang and Zhang (2014) examined the effects of oil price shocks on China's metals, petrochemicals, oil fats, and grains industries from October 2001 to November 2011. They found varying impacts across sectors, with petrochemicals being the most negatively affected and grains the least. Using five GARCH models and autoregressive conditional jump intensity, they highlighted the differential effects of oil price shocks.

Aye et al. (2014) assessed the impact of oil prices on South Africa's industrial output using monthly data from February 1974 to December 2012. Employing maximum likelihood tests, GARCH-in-Mean VAR, and modified bivariate VAR, they identified adverse effects and asymmetric responses to oil price shocks. Riaz et al. (2016) used ARDL regression and an EGARCH-in-Mean model to evaluate the effect of oil price

uncertainty on Pakistan's manufacturing sector. The results revealed a nonlinear relationship, with manufacturing initially rising in response to oil price uncertainty before declining after a threshold.

Al-Risheq (2016) studied the relationship between oil prices and industrial production in 52 developing countries from 1970 to 2012. Using a fixed effects model with instrumental variables, the study found that oil prices had a significant negative impact, with the real exchange rate playing a key role.

Yasmeen et al. (2019) investigated the impact of oil price changes on Pakistan's real sectors (manufacturing, transportation, electricity, and livestock) from 1976 to 2017 using ARDL models. The findings showed that while transportation and communication benefited, manufacturing, electricity, and livestock sectors suffered. Ahmed et al. (2012) analysed the effects of oil price shocks on US industrial production from 1980 to 2010 using CGARCH models, VAR models, and impulse response functions. They found that short-term oil price volatility significantly impacted industrial production in the long run.

Jiménez-Rodríguez (2008) used a VAR methodology to examine the impact of oil price shocks on industrial output in four EMU nations, the US, and the UK from 1975 to 1998. The results showed disparate effects, with similarities observed in the US and the UK. Farzanegan and Markwardt (2009) found that oil shocks in Iran had varying effects: positive shocks boosted industrial production by lowering the cost of imported inputs, while negative shocks had contractionary effects.

Petersen et al. (1994) studied the Texas construction industry in the 1970s and 1980s, finding that oil prices, tax policies, and interest rates significantly influenced construction activity and investor expectations. Okoye et al. (2018) explored the relationship between oil prices, Nigeria's GDP, and the construction sector, identifying high positive correlations but no direct causal effects. They suggested that growth in the construction sector was driven by broader economic activity.

Lin and Koo (1990) analysed China's agricultural and industrial sectors from 1952 to 1988, finding that industrial growth was influenced by agricultural expansion, but not vice versa. They attributed this to China's Soviet-style industrialisation strategy. Koo and Lou (1997) confirmed a one-way relationship, with industrial growth significantly impacting agriculture but agricultural growth having minimal effects on industry.



Tiffin and Irz (2006) used a bivariate Granger causality model to examine the relationship between agriculture and economic growth in developed and developing countries. While results for developed countries were inconclusive, developing countries showed a significant causal relationship between agricultural growth and economic development.

Siame-Namini (2017) investigated the impact of agriculture and services on economic growth in 62 developing countries. The findings indicated a direct correlation between services and growth but an inverse relationship between agriculture and growth. Singariya and Sinha (2015) analysed the contributions of India's agricultural and manufacturing sectors to GDP from 1970 to 2013, finding that agriculture influenced manufacturing and GDP per capita but did not identify the dominant sector.

Omorogiuwa et al. (2014) examined the impact of the 1970s oil boom on Nigeria's agricultural sector. They found that industrial expansion and rural-urban migration reduced the supply of agricultural raw materials, leading to increased food imports and economic instability. Adelman (1984) and Ranis (1984) emphasised agriculture's role in financing industrialisation during early development stages. Echevarria (1998) demonstrated that agriculture was less labour-intensive compared to services and industry in Canada.

The reviewed literature reveals significant relationships between oil prices, industrial production, and agriculture. Oil price volatility generally harms industrial sectors, though the extent varies by country. Agriculture plays a critical role in developing economies by fostering industrial growth, but its impact is less pronounced in industrialised nations. Future research should explore dynamic sectoral interconnections to inform policy recommendations for economic resilience amid industrial dependence and oil price fluctuations.

Methodology

3.1 Research Design

This study uses a sample survey form of quasi-experimental research design that systematically looks at the correlations between variables. This method fits the goals of the study and is appropriate for the social sciences.

3.2 Framework for Methodology

The research on Nigeria's oil pricing, agricultural output, and industrial sector performance takes a broad approach, incorporating several theoretical stances: The three main elements of economic interactions are actors (consumers, producers, OPEC), pay-offs (profit, market share, risk reduction), and strategies (predicting market reactions),

according to game theory (Von Neumann & Morgenstern, 1940). Oil-producing countries modify prices to affect market dynamics and profitability, according to the Predictive Theory of Oil Prices (Douglass, 1981). Nigeria, an oil exporter, bases its economic forecasts on the movements of the world's oil prices. Adam Smith's "Invisible Hand Theory" holds that supply and demand naturally drive the expansion of the industrial sector and that little government intervention is necessary to maintain market equilibrium. Together, these theories provide a framework for the analysis of the macroeconomic conditions in Nigeria between 1981 and 2022.

3.3 Model specifications

The Al-Risheq (2016) model, which was based on the tenets of oil price transition channel theory, was adapted for use in this study. The model he used to examine how oil prices affect industrial productivity in developing nations is as follows:

$$IND_{it} = \beta_0 + \beta_1 RER_{it} + \beta_2 RR_{it} + \beta_3 TO_{it} + \beta_4 OIL_{it} + \beta_5 GCF_{it} + \beta_6 TOT_{it} + \beta_7 FDI_{it} + \mu_{it}$$

Where;

IND = Industrial production

RER = Real exchange rate

RR = Real interest rate

TO = Trade openness

OIL = Oil price

GCF = Gross capital formation

TOT = Net barter term of trade

FDI = Foreign direct investment

μ_{it} = Error

Term $i = 1, 2 \dots 52$ $t = 1, 2 \dots$

The modified version of the above model is expressed at thus:

Model One: Oil Price and Industrial Sector Performance

$$IND_t = \beta_0 + \beta_4 OIL_t + \beta_5 RER_t + \beta_6 TOP_t + \mu_t$$

Where,

IND = Industrial production

RER = Real exchange rate

TOP = Trade openness

OIL = Oil price

μ_{it} = Error

Term $i = 1, 2 \dots 52$ $t = 1, 2 \dots$

Model Two: Agriculture and Industrial Sector Performance in Nigeria

The Waniko (2016) model was updated for this investigation. Agriculture and industry were broken down into their constituent parts for the study. The CBN classifies the agricultural industry into four parts: (i) forestry, (ii) cash crops, (iii) fisheries, and (iv) livestock. The non-agricultural sector can also be broken down into four parts, according to CBN: (i) industry; (ii) services; (iii) building and construction; and (iv) wholesale and retail. To determine the connections between them, each of these elements was examined separately. The complementary hypothesis between industry and the agricultural sector in the development process does not hold in Nigeria, according to Todaro and Smith (2011). To demonstrate whether the agricultural and industrial sectors complement each other in the growth process, agricultural and industrial output were regressed on gross domestic output. If the signs on the two sectors are the same, they complement; if they are different, they are non-complementary. The following model was estimated for the causality test:

$$\text{AGRIC OUTPUT} = f(\text{IND OUTPUT})$$

According to the Central Bank of Nigeria's classification, agriculture is categorised into four components: (i) forestry, (ii) cash crops, (iii) fisheries, and (iv) livestock. In this study, these components will serve as independent variables, while the industrial sector will be the dependent variable. **Also**, bank credit and exchange rates are incorporated to provide a macroeconomic context, illustrating the conditions under which these variables interact to enhance the efficiency of the industrial sector

$$\text{IND} = f(\text{OLP}, \text{CRP}, \text{FRP}, \text{LSP}, \text{FP}, \text{EXR}, \text{BCAS})$$

$$\text{IND}_t = \beta_0 + \beta_1 \text{OLP}_t + \beta_2 \text{CRP}_t + \beta_3 \text{FRP}_t + \beta_4 \text{LSP}_t + \beta_5 \text{FP}_t + \beta_6 \text{EXR}_t + \beta_7 \text{BCAS}_t + \mu_t$$

Where;

IND= Industrial Sector Output

OLP= Oil Price

CRP= Crops Production

FRP= Forestry Production

FIP= Fishery Production

LSP= lives stock Production

EXR= Real Exchange Rate

BCAS= Bank Credit

3.4 Description of Variables in the Model

Industrial Sector Output (IND): Industrial Sector Output (IND) refers to the **total production of goods and services** within a country's **industrial sector** over a given period. This sector includes **manufacturing, mining, construction, electricity, gas, and water supply**.



Oil Price (OLP): Oil Price (OLP) refers to the **market price per barrel of crude oil** at a given point. It is a key economic indicator that influences global and national economies, particularly for oil-producing countries like Nigeria.

Crop production, or CRP, is the practice of cultivating crops for both personal and commercial use. Large-scale production includes the production of rice, wheat, maize, jute, and other crops. Nigerian poverty could be decreased by increasing crop production.

Livestock Production (LSP): The management and breeding of farm, domestic, or livestock animals for the goal of getting their meat and products (leather, milk, eggs, etc.) is known as livestock farming. The prevalence of poverty will decline, and food availability will rise with more livestock production.

Fishery Production (FP) is a type of aquaculture, which is the scientific growing and management of all aquatic creatures. There are several subcategories of inland fishing, including commercial and marine; Nigerian poverty will decline as a result of increased fishing yield.

Forests (FRP) are known as woodlands, and related resources for the benefit of people and the environment are the science and art of forestry production. Both natural stands and plantations are used for forestry. In Nigeria, forestry production tends to alleviate poverty.

The price of one nation's currency in relation to another is known as the exchange rate, or EXR. When nations utilise gold or another established standard, the exchange rate is "fixed" and each currency is worth a certain amount of the metal or other standard. Nigerian poverty would rise as the currency rate appreciates.

Market Size (MKZ): Credit to Agriculture from Deposit Money Banks (DMBCA): Credits are loans that farmers take out to launch or grow their farms. It could be cash or in kind. The source of the credits determines the amount of interest that must be paid over time. Nigerian poverty will decrease if bank credit to agriculture is increased.

3.5 Sources of Data Collection

The data for this study were obtained from secondary sources, including the Central Bank of Nigeria's (CBN) Statistical Bulletin, the National Bureau of Statistics (NBS), World Bank publications, academic journals, books, and conference papers. The study employed time series data spanning the years 1981–2022.

3.6 Data Analysis Method

This study employs the Auto-Regressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001). The choice of this method is justified by the advantages of ARDL in determining the existence of a cointegrating relationship in both the short and long term. The ARDL bounds testing approach offers several econometric benefits over previous single-equation cointegration techniques, such as those proposed by Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990).

First, it addresses endogeneity concerns and overcomes the limitations of the Engle-Granger (1987) method, which is unable to test hypotheses on estimated coefficients over extended periods. Second, the ARDL approach simultaneously estimates both short- and long-run parameters, improving analytical efficiency. Third, it eliminates the need for pre-testing unit roots and determining the order of integration among variables, which can be a significant burden in other econometric methodologies. The ARDL approach is applicable regardless of whether the regressors are purely $I(0)$, purely $I(1)$, or fractionally integrated, allowing for greater flexibility in testing long-term relationships among variables.

Additionally, the ARDL bounds testing approach exhibits superior small-sample properties compared to multivariate cointegration techniques, as noted by Narayan (2005) and Halicioglu (2007). Consequently, this method overcomes the limitations associated with the Johansen-type framework when working with a combination of $I(0)$ and $I(1)$ regressors, thereby enhancing the robustness of the analysis.

4 Data Analysis

Table 1: Descriptive Statistic

	IND	OLP	FDI	CRP	FP	LSP	FRP	EXR	BCAS
Mean	51.39590	47.55425	1.532841	17361.35	256.5798	698.6940	108.7770	94.60825	3155944.
Median	49.00000	49.60000	1.129236	4067.900	138.5800	561.7800	88.38000	106.4650	544997.2
Maximum	72.00000	81.81000	5.790847	165786.4	3579.060	1308.130	192.7500	297.4500	12456251
Minimum	30.00000	21.12000	0.257422	1618.990	40.65000	341.4100	67.31000	0.620000	24654.90
Std. Dev.	11.71810	18.20667	1.224274	39343.19	549.0571	298.2280	38.64390	88.19641	3926360.
Skewness	0.439904	-0.049722	1.774387	3.174141	5.737662	0.659768	0.921217	0.553929	0.903100
Kurtosis	2.246539	1.765374	6.213149	11.38378	35.26820	1.956250	2.371351	2.270084	2.345650
Jarque-Bera	2.180368	2.556985	38.19687	179.7063	1954.867	4.717653	6.316268	2.933543	6.150883
Probability	0.336155	0.278457	0.000000	0.000000	0.000000	0.094531	0.042505	0.230669	0.046169
Sum	2004.440	1902.170	61.31364	677092.5	10263.19	27947.76	4351.080	3784.330	1.26E+08
Sum Sq. Dev.	5217.923	12927.84	58.45504	5.88E+10	11757086	3468657.	58240.70	303365.7	6.01E+14
Observations	39	40	40	39	40	40	40	40	40

Source: Eviews 10.05 output

The summary statistics of important variables from 1981 to 2024 are shown in Table 1. Oil Prices and the Performance of the Industrial Sector: With a range of 30.00 to 72.00, the mean values are 51.40 and 49.00. The series has a mesokurtic (2.25) and right-skewed (0.44) distribution. Normalcy is confirmed by the Jarque-Bera test (2.18, 0.34). The price of oil ranges from 21.12 to 81.81, with 49.60 serving as the median. The series is platykurtic (1.77) and left-skewed (-0.05). Normality is indicated by the Jarque-Bera test (2.18, 0.34). Crop Production: Range: 1,618.99 to 165,786.4; Mean: 17,361.35; Median: 4,067.90. The series is leptokurtic (11.38) and heavily skewed to the right (3.17). Normalcy is rejected by the Jarque-Bera test (179.71, 0.00). Fishery Production: range 40.65 to 3,579.06, mean 1,256.58, median 138.58. The series is leptokurtic (35.27) and heavily skewed to the right (5.74). Normalcy is rejected by the Jarque-Bera test (1,954.87, 0.00). Livestock Production: 341.41 to 1,308.13, median 561.78, mean 698.69. The series is platykurtic (1.96) and right-skewed (0.66). Normality is suggested by the Jarque-Bera test (4.72, 0.09). Forestry Production (mean 108.78, median 88.38, range 67.31 to 192.75). The series has a mesokurtic (2.37) and right-skewed (0.92) distribution. Normalcy is rejected by the Jarque-Bera test (6.32, 0.04). The exchange rate is between 0.62 and 297.45, with a mean of 94.61 and a median of 106.47. The series is platykurtic (2.27), and it is right-skewed (0.55). Normalcy is confirmed by the Jarque-Bera test (2.93, 0.23). Bank Credit to Agriculture: 24,654.90 to 12,456,251; mean 3,155,944; median 544,997.2. The series is mesokurtic (2.35) and right-skewed (0.90). Normalcy is suggested by the Jarque-Bera test (6.15, 0.05). Overall, certain series demonstrate normality, but others show deviations from the normal distribution, especially in agricultural and fisheries productivity, which show substantial skewness and kurtosis.

Table 2: Stationarity Test

S/N		LEVEL			FIRST DIFFERENCE			ORDER
		T. stat	Crit, Value	Prob. Value	T. stat	Crit, Value	Prob. Value	
1	OIP	-2.787237	-3.533083	0.2105	-8.799831	-3.536601	0.0000	I(1)
2	CRP	-10.29399	-3.536601	0.0000				I(0)
3	LSP	-1.309296	-3.529758	0.8708	-4.271479	-3.533083	0.0088	I(1)
4	FP	-5.382983	-3.529758	0.0004	-	-	-	I(0)
5	FRP	-1.585182	-3.529758	0.7807	-7.067649	-3.533083	0.0000	I(1)
6	BCAS	-1.121648	-3.529758	0.9122	-5.649447	-3.533083	0.0002	I(1)
7	EXR	-1.922102	-3.529758	0.6240	-5.945111	-3.533083	0.0001	I(1)

Source: Eviews 10.05 output

The stationarity test results for Model One utilising the Augmented Dickey-Fuller (ADF) unit root test are shown in Table 2 for the reviewed period. The findings show that following first differencing, every variable became stationary, with the exception of crop production (CRP) and fishery production (FP). This implies that FP and CRP were either

mean-reverting or already stationary. Time-series data are intrinsically stochastic and frequently show non-stationarity, according to Box and Jenkins (1970). In order to overcome this, researchers usually use differencing to attain stationarity. First differencing was necessary for the other variables in this investigation to become stationary. In the end, the study discovered a mixed order of integration, which supported the estimation of the dynamic equation using the Autoregressive Distributed Lag (ARDL) model, which was put out by Pesaran, Shin, and Smith (2001).

Table 3: Test for Cointegration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.230239	10%	1.99	2.94
K	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Source: Eviews 10.05 output

Table 3's conclusions show that, at the 5% significance level, the F-statistic value of 4.230239 is more than the upper bound critical value of 3.28. The alternative hypothesis of a long-term connection is thus accepted, whereas the null hypothesis of no long-term relationship is rejected. This result suggests that the model's variables are cointegrated, which means they have a long-term equilibrium connection and will eventually converge. To capture short-run dynamics, additional analysis was done to evaluate the error-correcting mechanism (ECM) and predict the long-run coefficients given the existence of a long-run relationship.

Table 4: Long Run Result

Variable	Coefficient			
	t	Std. Error	t-Statistic	Prob.
LOG(CRP)	15.189964	7.114336	2.135121	0.0460
DLOG(OLP)	0.311068	0.142430	2.184009	0.0369
LOG(FP)	-7.917667	11.236461	-0.704641	0.4896
LOG(FRP)	54.475017	58.227303	0.935558	0.3612
LOG(EXR)	8.834097	3.876114	2.279112	0.0344
LOG(BCAS)	2.089027	4.919689	0.424626	0.6759
	337.73194			
C	1	148.552349	2.273488	0.0348

Source: Eviews 10.05 output

Crop production eventually boosts industrial sector output, increasing industrial output by 15.20% with a statistically significant effect at the 5% level. This defies theoretical predictions, though, since higher crop yields ought to raise household income rather than make poverty worse. One explanation could be because Nigeria's production of staple foods largely serves immediate family needs rather than promoting economic expansion. On the other hand, although livestock and fisheries may have a negative impact, forestry, fisheries, and livestock production do not significantly affect industrial output over the long term. Furthermore, bank loans to the private sector have a slight but beneficial impact, indicating that finance for agriculture does not significantly influence the output of the industrial sector. Industrial output increased by 8.83 units as a result of the naira's strong positive impact on the dollar exchange rate. This implies that historically, especially since the IMF-led Structural Adjustment Program (SAP) in 1986, currency depreciation has accompanied increases in industrial output. This result, which reflects the long-standing volatility of Nigeria's exchange rate, is consistent with economic theory.

Table 5: Error Correction Regression/Short Run Result

Included observations: 34

ECM Regression

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IND(-1))	-0.237532	0.103527	-2.294392	0.0333
LOG(OLP)	0.688741	0.150488	4.576718	0.0001
DLOG(CRP(-1))	14.60613	1.839696	7.939425	0.0000
DLOG(FP)	11.20505	3.627871	3.088603	0.0060
DLOG(FP(-1))	11.11837	3.359175	3.309851	0.0037
DLOG(FRP)	34.52463	16.79222	2.055989	0.0538
D(EXR)	0.007992	0.053865	0.148364	0.8836
CointEq(-1)*	-0.146059	0.024562	-5.946647	0.0000
R-squared	0.770407	Mean dependent var	0.505882	
Adjusted R-squared	0.708593	S.D. dependent var	9.840237	
S.E. of regression	5.311966	Akaike info criterion	6.380125	
Sum squared resid	733.6417	Schwarz criterion	6.739269	
Log likelihood	-100.4621	Hannan-Quinn criter.	6.502604	
Durbin-Watson stat	2.186345			

* p-value incompatible with t-Bounds distribution.

Source: *Eviews 10.05 output*

The combined impacts of the independent variables in the model may account for almost 77% of the fluctuations in Nigeria's industrial sector production, according to the R-squared value of 0.770407 and the adjusted R-squared value of 0.708593. The error term accounts for the remaining 23% of the changes, which are caused by variables that the model does not account for. By considering the degrees of freedom and indicating that

the model does not experience overfitting, the adjusted R-squared value—which is somewhat less than the R-squared value—confirms the model's dependability.

The Durbin-Watson statistic score of 2.186345 indicates that the series' residuals do not exhibit first-order autocorrelation. This is crucial because autocorrelation in a regression model might produce biased and ineffective estimates, rendering the findings unsuitable for policy recommendations. Since there is no first-order autocorrelation, the estimated parameters are resilient, and the residuals of the model are randomly distributed.

In a well-defined error correction model, it is predicted that the error correction term (ECT) would be negative and statistically significant at 5%. Any short-term imbalance in industrial sector output will eventually be remedied, guaranteeing convergence towards equilibrium, as the ECT's negative sign attests. Nigeria's industrial sector adapts to changes in explanatory variables or economic shocks rather fast, as indicated by the magnitude of the error correction coefficient (0.75), which suggests that almost 75% of any disequilibrium from the prior period is corrected within a year.

Current industrial sector output is negatively impacted in the short term by the lagged value of industrial sector output, and this effect is statistically significant at 5%. According to the coefficient value of -0.237532, the current industrial output falls by around 0.2375 units for every unit increase in the previous industrial output. This adverse effect may be ascribed to structural inefficiencies in the industrial sector, declining returns to scale, or cyclical economic volatility.

At the 5% significance level, crop production positively and statistically significantly affects the output of the industrial sector. All other things being equal, an increase of one unit in the crop production perception index results in an increase of 8.2931 units in industrial sector output. Furthermore, the lagged value of crop production (CRP), which contributes 14.6061 units to the output of the industrial sector, also has a significant beneficial impact. This implies that agricultural output, both past and present, is essential to boosting Nigeria's industrial development. Links between agriculture and industry, where raw materials from crop production are employed in agro-based businesses including food processing, textile manufacture, and biofuel sectors, may be the main driver of the increase in industrial output.

At the 5% level, there is a statistically significant positive correlation between industrial sector output and fishery production (FP) and its lagged value. The output of the industrial sector rises by 11.2051 units when fishery production rises and by an additional 11.1184 units when fisheries production from the prior period increases. This result is consistent with economic theory, which holds that higher agricultural output can boost the expansion of the industrial sector by supplying raw materials, job opportunities, and a steady supply of food, all of which boost worker productivity.



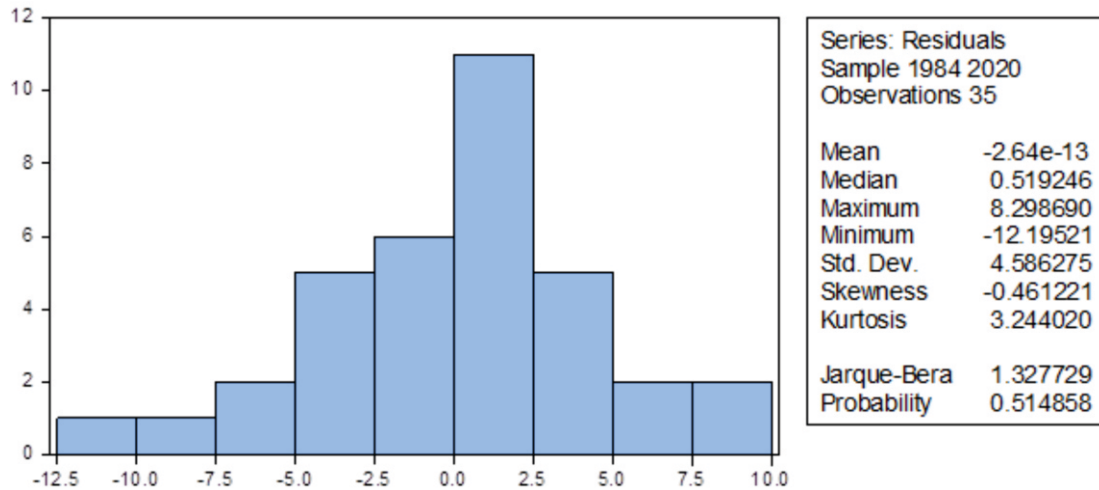
At 5%, the positive impact of forestry production on industrial sector output is not statistically significant. This implies that although forestry production might have an impact on industrial activity, it was not powerful enough to propel notable industrial expansion during the study period. Underdeveloped value chains, little investment in the wood processing sector, or environmental constraints on deforestation could all be contributing factors to the comparatively minor contribution of forestry products to industrialisation.

In a similar vein, the output of the industrial sector is positively impacted by the exchange rate, but statistically insignificantly. In theory, a decline in the value of the currency can increase the competitiveness of domestically produced items in global markets, which could lead to an increase in industrial production. The coefficient's insignificance, however, indicates that industrial output has not been significantly impacted in the near term by the Naira's decline versus the dollar. The potential advantages of a lower currency may have been outweighed by Nigeria's reliance on imported industrial inputs, which would have raised production costs rather than output.

The results demonstrate how important agriculture is to Nigeria's industrial sector growth, especially in relation to agricultural and fishery production. The adverse effect of historical industrial output on present-day output, however, points to structural inefficiencies that might be impeding long-term industrial growth. Although shocks may momentarily impair industrial output, the error correction process demonstrates that the sector has the capacity to adapt and return to equilibrium in a comparatively short amount of time.

Important policy considerations are raised by the negligible effects of exchange rate changes and forestry productivity. To lessen the negative consequences of exchange rate volatility, specific measures may be required to support forestry-related companies and lessen reliance on imports. The report concludes by stressing the role that agricultural output plays in the development of the industrial sector and the necessity of legislative actions to improve the sustainability of Nigeria's industrial expansion.

Post Estimation Test for Model Two



Source: Eviews 10.05 output

Researchers examine the normalcy of the regression residual in order to assess the validity of regression. The researcher can ascertain whether the estimated equation complies with the fundamental tenet of ordinary least squares by using this post-estimation test. We claim that the residuals are normally distributed based on the Jarque-Bera statistic's value of 1.327729 and its probability value of 0.514858.

Table 5: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.572503	Prob. F (2,17)	0.5746
Obs*R-squared	2.208608	Prob. Chi-Square (2)	0.2992

Source: Eviews 10.05 output

We used the Breusch-Godfrey Serial Correlation LM Test to determine whether the error term was serially independent. We claim that there is no evidence of serial correlation in the study's residual and that the estimated equation is blue because the F-statistic value of 0.572503 and the observed R-square value of 2.208608 are statistically insignificant with probability values of 0.5746 and 0.2992.

Table 6: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.650230	Prob. F(15,19)	0.7992
Obs*R-squared	11.87234	Prob. Chi-Square(15)	0.6887
Scaled explained SS	3.925582	Prob. Chi-Square(15)	0.9980

Source: Eviews 10.05 output

The variance of the residuals was evaluated using the Breusch-Pagan-Godfrey heteroskedasticity test, which ensures adherence to the traditional least squares assumptions. The test findings showed the presence of homoskedasticity with respective probability values of 0.7992, 0.6887, and 0.9980 for the F-statistic (0.650230), Obs*R-squared (11.87234), and scaled explained SS (3.925582). The Best Linear Unbiased Estimator (BLUE) characteristics are thus satisfied by the estimated equation.

The accuracy of the macroeconomic model was verified for model definition using the Ramsey RESET test. The model's proper specification and appropriateness for the study were confirmed by the test results, which showed that the F-statistic (0.274677) and T-statistic (0.524096) shared a probability value of 0.6066. As a result, the estimated equation maintains its BLUE status, guaranteeing its inference reliability.

Tabel 7: F-test summary:

	Value	df	Probability
t-statistic	0.524096	18	0.6066
F-statistic	0.274677	(1, 18)	0.6066

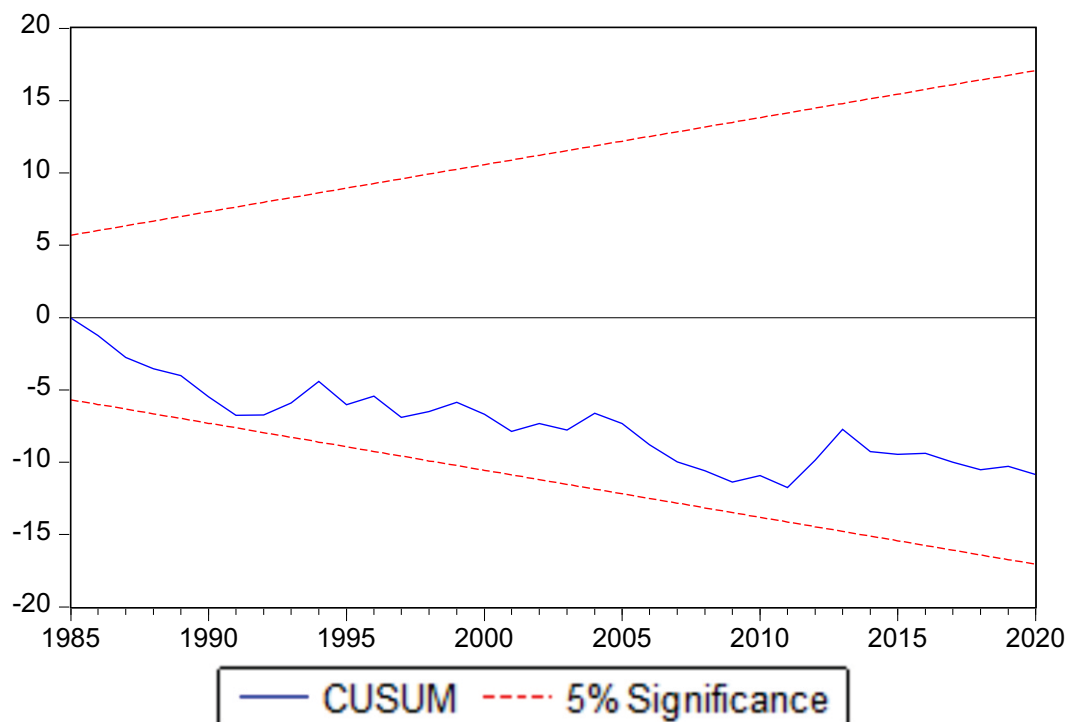
Table 8: Test SSR

	Sum of Sq.	df	Mean Squares
Test SSR	10.74909	1	10.74909
Restricted SSR	715.1532	19	37.63964
Unrestricted SSR	704.4041	18	39.13356

Source: Eviews 10.05 output

Model Stability Test

The cusum test was used to assess the stability of the macroeconomic model included in the study. The relative stability of the equation estimate can be ascertained by the researcher using the cusum test. The estimated equations are within the permitted minimum, as can be seen by closely examining the cusum plot below.



Source: Eviews 10.05 output

Examining the hypothesis produced by the estimated macroeconomic models, the findings discussion analyses the relationship between Nigeria's oil price, agricultural output, and industrial sector output between 1981 and 2020. The ARDL model's short- and long-term outcomes are taken into account.

Oil Prices and the Industrial Sector

According to the ARDL model, there is a positive long-term correlation between oil prices and industrial sector output, indicating that the expansion of the industrial sector has been fuelled by growing crude oil prices. Thus, the alternative hypothesis is supported, and the null hypothesis—that there is no relationship—is rejected. This runs counter to what some researchers have found.

Output of the Industrial Sector and Foreign Direct Investment (FDI)

The ARDL model's results demonstrate that FDI has a statistically significant negative influence on industrial sector production. This implies that although FDI fosters economic progress, Nigerian industrial growth has not resulted from it. This unfavourable link necessitates more investigation, especially since Nigeria's FDI inflows have varied but grown over time. The analysis rejects the null hypothesis and confirms earlier findings that FDI has a negative impact on Nigeria's industrial sector output.

Output from the Industrial and Agricultural Sectors

Crop Production: The calculated model indicates a notable short-term favourable impact, but this effect is transient and not long-term sustainable. The rejection of the null hypothesis demonstrates the connection between the development of crop production and short-term industrial growth.

Livestock Production: The findings show no discernible impact on the output of the industrial sector, indicating that livestock production is not a key factor in determining Nigeria's economic expansion. We accept the null hypothesis. **Fish output:** Short-term findings show a favourable effect, indicating that higher fish output supports the expansion of industry. We reject the null hypothesis. **Forestry Production:** Results show no discernible correlation between industrial sector output and forestry production, suggesting that forest resources do not propel industrial expansion. We accept the null hypothesis.

Exchange Rate and Production in the Industrial Sector

According to the ARDL model, short-term industrial sector output is positively impacted by exchange rate appreciation. However, since devaluation usually increases industrial competitiveness, this runs counter to economic theory. We reject the null hypothesis. All things considered, the results show how intricately the oil price, foreign direct investment, agriculture, and exchange rate interact to shape Nigeria's industrial sector.

5. Summary, Conclusion, and Recommendation

This research is both necessary and timely, given the fluctuations in Nigeria's industrial output during the study period. Empirical studies have produced mixed findings on the direct relationship between oil prices, agricultural output, and industrialisation in both developed and developing nations, resulting in a wealth of literature. However, many of these studies lack the detailed breakdown of agricultural output, which is a key focus of this investigation. By disaggregating agricultural output into crop production, livestock production, forestry production, and fisheries production, this study examines the



interplay between oil prices, agricultural output, and industrial sector performance in Nigeria from 1981 to 2022.

The study employs the dynamic equation modelling system developed by Pesaran, Shin, and Smith (2001). Given the mixed order of integration in the time series data, the autoregressive distributed lag model (ARDL) was selected for its robustness in analysing cointegrating relationships. The findings reveal several key insights. An increase in oil prices leads to a rise in Nigerian industrial output, while increased foreign direct investment negatively impacts industrial output. Higher crop production and fishery production positively influence industrial output, and an appreciation in the value of the dollar also boosts industrial performance. These findings highlight the complex dynamics between oil prices, agricultural output, and industrial performance in Nigeria, providing valuable insights for policymakers aiming to foster sustainable economic growth.

Conclusion

This research on the impact of agriculture and oil prices on industrial output reveals that foreign direct investment (FDI) inflows are gradually narrowing the gap between these sectors, even as rising oil prices contribute to increased industrial output in Nigeria. The study highlights that agricultural production and practices, particularly crop and fishery production, are the primary drivers of industrialisation in Nigeria, serving as key transmission mechanisms. The positive impact of crop production on industrial output underscores the significant role of agriculture in Nigeria's economy. However, it also highlights a critical challenge: the majority of Nigerians are peasant farmers who lack the resources needed to improve their economic standing, thereby limiting the potential for broader industrial growth.

Recommendations

The following suggestions are useful based on the inferences made from the study on how Nigerian industrial output is impacted by agriculture and oil prices:

Regarding Policy

- i. The Nigerian government ought to support agricultural products produced mechanically.
- ii. The sectors that have the potential to boost the nation's economy through industrial output should get the majority of foreign direct investment inflows.
- iii. Reliance on the price of oil as a gauge of economic viability should be carefully watched due to its short-term insignificance for the country's economic progress.
- iv. In order to change prevailing narratives, crop production had to be given priority as the main source of sustenance for the general public.



- v. To boost economic growth through industrial output, the government should spend more in fisheries production. Investment in forestry output ought to come after reforestation.
- vi. In order to strengthen the country's economic status through industrial output, the issue of the dollar-to-naira exchange rate should be addressed by investing in industries that may drive the appropriate foreign exchange rate.

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