



# BULLION

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by: Shehu Muhammad





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## Digital-Only Banks

### The Changing Face of Global Banking: Challenges, Opportunities, and AML/CFT Implications for Nigeria



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#### Abstract

The drastic digitization brought about by evolution of technology in the world has changed almost every sphere of human life with the most recent effect being a move to cashless economy. While the role of digitization in the banking sector is altering customer demand and preferences, banks are becoming more digitally oriented to meet the forces of demand and supply. This has led to the birth of digital-only banks also called challenger banks or branchless banks as they operate without a physical location, only have a location for admin purposes or hosting their servers. This growing wave of consumer-oriented banking institution focuses on serving their clients exclusively through online means, no physical locations and focusing on real time data analytics. In this paper I will discuss digital-only banks as a changing face of banking in Nigeria, challenges and opportunities, regulatory concerns by the authority, Nigeria population demographics and how the youths will benefit from digital-only banks, their merits and demerits, their impact on Nigeria's economy as a developing country, and how they will change the face of doing business amongst the youths in Nigeria.

**Keywords:** Digitization, banking, digital-only-banks, digital strategy, customer demand, AML/CFT concerns, security, online, data analytics, scalability, Suspicious Transactions, PEP, Know Your Customer, Enhanced Due Diligence, Enhanced Customer Due Diligence, KYB.

#### Introduction

Before the global economic crisis of 2008-2009 the financial sector and the banking industry had achieved high value for their shareholders through a massive financial gain. To that effect, current growing systems and competitive challenges had to seek alternative sources of value for the banking sector and that's when digital banking came into effect. The earliest form of digital banks has its roots in the advent of ATMs and cards launched in the early 1960s but their effect took place in the 1980s upon the introduction of the world wide web and digital networks when retailers were connected to suppliers as the need for online catalogs and inventory software system was in high demand. A digital-only bank came to provide banking facilities, exclusively via digital platforms like mobile and tablets connected to the internet offering the most basic banking services, no physical location and operates in a very simplified manner with the aid of electronic documentation, real-time data, and automated processes. In most cases requirements in opening an account with digital-only banks are the application link and few personal verification documents as the banks do not have physical address for the normal banking activity only location for admin and their servers. Its emergence to many parts of the world like Nigeria enabled a new degree of freedom to the banking new entrant's ecosystem providing a 'David vs Goliath' dynamic which compelled them to iterate quickly as compared to the incumbent traditional banks. From their unique ability to access daily banking functions via mobile devices, empowering cashless transactions, it would appear digital-only-banks is not just the future of banking but a total banking evolution.

With the development of technology, banking sectors have given their customers easy access to mobile devices that have access to online and digital services. While looking at the high end banking expectations of millennials and coming generations digital-only banks emerge as the most influential choice of these potential customers.

Badmus, G. (2019) asserts that digitization has made most physical banks lose out these opportunities on their expansion due to the fast-moving technological transformation as most of their customers are willing to switch their services for this unique feature in bills payment, efficient sending of money, fast transfer speed, and access to loan products safely and conveniently without physical appearance in banks. Digital-only banks is a general term that covers a broad group of financial service providers offering banking services exclusively through digital means and with no physical locations

and are chartered as financial institutions by the federal regulator, or the parent company is a chartered financial institution. Most of digital-only banks are created by brick and mortar banks or affiliated to the banks but their services are exclusively online as they don't have physical location like other banks offering digital banking services. According to Wang, Nnaji, & Jung, (2020) The financial sector is considered one of the most affected sectors by the proliferation of a new wave of technology, mostly digital and online banking as banks of all sizes and manner are choosing to operate and run their businesses under a digital platform, in the sense that this new medium is offering unique and distinct advantages to all the parties involved. Digital-only-banking is not only simple and convenient to the user but offers superior customer experience through analyzing the customer experiences by use of social and geo-related insights. Among customer benefits using digital-only banks include easy sign up process, faster bills payments, access to account through app, easy expenses management, and use of real data analytics. Nigeria has six digital-only banks which are ALAT, Kuda, Rubies, Eyowo, VFD, and sparkle. The number of digital-only banks users in the world is growing at an increasing rate while offering a competitive advantage to the public and private banking sectors. Its adoption by many users is based on a range of factors that are not limited to its reliability, a high degree of comfort, safety, user-friendly interphase, and the social impact amongst the users of these products (Wang, Nnaji, & Jung, 2020). This has made digital-only banks more of a norm rather than an exception in many developed and developing countries as it offers the banking industry a cheap way of providing services. The finance sector has virtually 100% cloud-based business that leverages the expertise of cutting-edge digital networks, rather than relying too much on stand-alone and obsolete technology. Digital-only banking systems such as Chime, N26, and Monza provide accounts checking to customers without the hassle of going to the branch Taiwo, (2018) Digital-only banking is very easy to do and it is convenient to use online services, mobile banking, ATM, and debit cards, it takes time and resources to go to the banks and set up, manage the accounts Taiwo, (2018) Banks had boards set up at their branches, defining the time required for different services. It takes time to even just cash a check. But digital banking is instant, with no time constraints. Digital-only banking has greatly lowered the operational costs of banks. This has made it possible for banks to charge lower service charges, and also to offer higher deposit interest rates. Lower operating costs mean more income for the banks. Chiemeké, and Chete, (2016) explained that the number of customers for banks would rise due to the increased convenience of

anytime, anywhere banking. Human error in measurement and record-keeping will be minimized. By maintaining records of the transaction electronically, it is possible to produce reports and review data at any stage and for various purposes. This shows that banks are not relying on investing in physical locations anymore as they see potential in the growth of digital-only banks services considering its more user-friendly to their customers. The key benefits of these digital only banks are cost reduction, their agility through moving into the digital space, viability as their operations is incredibly successful, increase in revenues as they create a larger market audience for their services while attracting and retaining more customers.

### Problem Statement

As the banking dynamics and environment changes so is the customer satisfaction changing bringing a challenge to banks on how well they are meeting their customer demands as well as exceeding expectations. While customer satisfaction is the most important factor in any organization the primacy of traditional banks relationship in Nigeria is under threat as influence on digital-only banks is slowly gaining momentum. When customer demands are met their utility and satisfaction will increase otherwise with less satisfaction, they will look for services elsewhere. While technology has brought a new wave of digitization in the society, consumer behavior in banking is rapidly changing as every customer expects digital and retail banking at any time, place and anywhere. This has prompted many banking institutions to focus more on customer relationship management as less satisfied customers using traditional banking models will change their banking institutions to see what other banks have to offer.

### Literature Review.

Majority of scholarly articles, research papers and literature on internet and digital banking suffers from narrow focus on electronic money. most ignore digital-only banks entirely while focusing on electronic money and substitution of banking models to customer through smart cards, mobile money and virtual currency. Most of them propose that electronic and digital banking consist of stored value cards, network money and digital banks while use of digital-only banks has been completely ignored. Despite this narrow scope of research, there are none the less few studies that address importance, challenges and opportunities of digital-only banks in Nigeria. I have identified this research gap and will discuss the possibility of digital-only banks flourishing in a developing country like Nigeria , challenges, opportunities , know your customer and



anti-money laundering regulations of digital-only banks by the regulating authorities in Nigeria.

**Importance of digital-only banks in Nigeria**

Trends for the adoption of digital-only banks are rapidly increasing after the surge of the covid-19 virus and the pattern might last well once the pandemic is over. For financial institutions and the banking sector, this has presented a good opportunity that embraces the benefits of digital-only banks while giving their customers the ability to bank, move funds and transact at their pleasure. This comes at a time when the world is faced with the advent and need of digital banking in financial services. The pandemic has increased the need for use of digital-only banks as the government has put restrictions on the number and amount of withdrawals as well as long waiting times in banking halls. Kuda bank a digital-only bank in operation since 2019 with only 500 customers says their customer base is increasing daily a trend that began during the lockdown in Nigeria's main cities like Lagos and Abuja. Another digital-only bank sparkle CEO said that "seeing the impact of COVID, and the fact that we are headed to another wave as experts tell us, we as bankers need to build resilience into our business and that means being digital.

The Banks have created a challenge to the existing retail banks in developed economies, as the pace to market and digitization of banking services draws attention because of the potential to make daily banking easily available. Salami, (2018) asserts that with the surge of the covid-19 virus, many banks around the globe temporarily closed their operation centers and branches as their regular customers kept a social distance in their homes, taking advantage of cashless payments, and digital banking was their preferred payment option. However, Digital-only banks have a greater role in Nigeria than just a contest between digital banks and retail banks alone. The banks are always open, there is no point in complaining about the 8.00-4.00 pm banking hours, the customers can gain constant access to their funds 24/7 with more spending options for their cash.

According to EY's global fintech adoption index data presented by price water house coopers in 2020, financial technology and digital-only banking services adoption has doubled in the last three years. March 2020 data indicates that 64% of digitally active consumers across 10 markets used digital banking services with 20% of the population using digital-only banks.

**Digital banks adoption among internet users in selected countries, march 2020**

<b>% of respondents in each group</b>
China 87%
India 87%
Russia 82%
South Africa 80%
Peru 74%
Nigeria 66%
Italy 41%
USA 57%
France 35%
Japan 30%
<b>Worldwide 64%</b>
<b>Source. Global fintech adoption index 2020 <a href="http://www.insider.com">www.insider.com</a></b>

The survey indicated that global awareness of digital-only banks and financial technology products in the world stands at 90%. Although the usage of these services is still heavily skewed towards a higher demographic segment in countries like Nigeria, hurdles like security issues and privacy exists but the growth has great potential to achieve a 90-99% success rate with consumer education.

Growth of digital banking has made the world witness a somewhat weighing of the future of bank branches as north America and European banks have been forefront in accelerating branch closure both in local and international market. While responding to evolving consumer psychology and their expectations, western countries have been operating on a wash-wash market with digital-challenger banks as the likes of Ally, Monzo, and N26 have been hitting headlines with their digital-only bank products. This comes at a time when fanfare is falling more intensely on North America and European banks as the wave is creating fan in unexpected places (Nel & Boshoff 2021). This was seen by the unlikely darling of money in Asian banks on 2018 when Kakao bank established an entity of Digital-only bank and in less than 24 hours of its launch they had nearly 300,000 users registered. Within a week the digital-only bank had transacted an amount of \$245 million and at the same time more than \$260 million in digital loans were issued. The digital-only bank currently has brought \$5.75 trillion in deposits and over 5.2 trillion in loan has been issued. This performance has been rated successful by local and international news media.

Referring to Nel & Boshoff, (2021) In a case of extend without overextending Africa has seen its fair share of local investors brining life into a digital-only bank. Zazu bank which is an intermediary of African Agri-tech start up announced its intention to establish Zambia first Digital-only bank in 2017 and within the first financial year they had registered deposits amounting to \$218,000.

The striking trend seems to be international banks expanding their market share to new territories by entering new market with purely digital-only bank products. A major banking product consumers survey by Accenture released in May 2020 says that "value for the money" is the single most reason consumers consider while dealing with financial institutions while 39% of the respondents says that biggest priority in banking with a financial institution is "able to manage my account in a way that suits me". Digital-only banks despite few knowing of its existence is the most preferred banking option.

Nigeria had its home-grown disruptor with its first entry of digital-only bank in 2015 Lidya, the country first fully-fledged digital bank with its parent body (SunTrust bank of Nigeria) posted a profit after tax of naira 212.7 million (\$656252) in its first 2015/2016 financial year.

Nigeria a developing country rich in mineral deposits and agriculture has a rich economy and is moving in the right direction as the government has invested heavily in ICT and technology. Internet connectivity has increased rapidly with a percentage of 3.5% in 2005 to 42% in 2020 while their GDP per capita has increased to 4500\$ at the same period.

This move has revolutionized the Nigerian banking industry which started in the year 2004 with the introduction of the internet and mobile banking by the Nigerian central bank. The move from traditional to digital-only banks followed a great reformation of Nigerian banks which left only 25 banks in operation from the ones that initially existed. This was triggered by the customer's appetite for efficient services in the delivery of the existing banking services. Their convenience in Nigeria is queen as they offer the ability to access, move funds, check account balances, pay their utility and shopping bills, as well as the instant loan application. "Security is the number 1 priority in the banking sector," says Badmus, (2019) a banking expert, and his message extends to digital-only banks. With threats of insecurity existing everywhere in Nigeria due to high unemployment levels, and massive corruption digital banking makes it easy to take extra security precautions for individual cash in banks. Digital-only banks only applications allow the users to use biometric authentication in their login process with login options such as fingerprint and facial recognition.

The banks have made a digital transformation to the Nigerian economy as the digital shift allows households and individuals to gain access to their accounts, services that were in the past held by brick and mortar locations around the country. ICT departments in Nigerian banks have progressed their moves as more customers are gaining access to banking services online while trying to keep up with the adoption of the digital era.

Digital-only banks reduce costs involved in transactions as reinvestment of money into digital services helps in reducing the cost of operations for the traditional model of the banking system and the reduced cost helps in settling rent cost, upkeep of the banking facility, and reduction of physical exercise that comes along with brick and mortar. (Tahini, Mgbemena, Trab, & Masa'Deh, 2015).

The digital-only -banks increase revenues as their accessibility creates a huger market audience for offering its services which ultimately increases the revenues for their businesses. The digital-only banks and other financial institutions will be in a position to increase their revenues as well as the establishment of a customer base that will help increase demand for their customer base.

Digital-only banks have helped businesses attract and retain more customers in their businesses as the majority of customers tend to be committed and loyal to businesses and companies that are innovative and offer better services. They also help most businesses stay ahead of time and gives a competitive advantage.

## CONCEPT OF DIGITAL-ONLY-BANKS, ONLINE BANKING AND BRICK AND MORTAR

### Online Banking

The worldwide web has changed the dynamics and culture of doing business in different ways. As one can maintain an entire financial portfolio through different online means that are provided for by this feature but have physical locations. This is simply a form of personal banking which can be conducted by use of the internet, but digital-only banks are more of an overarching term referring to all forms of financial technology taking place with the aid of technology. While online banking only handles essential transactions, digital-only banks goes away deeper to mandate a comprehensive re-engineering of banks internal systems as it encompasses all digital transactions. The internet-based account management service allows its different customers to check their account balances, transactions, and transfer of funds between other online users and accessing loans but



have physical banks unlike digital banks where everything is done through mobile application including account opening. Referring to Cunha, (2020) this concept was developed in the late 1980s by presidential savings banks, online banking was envisioned for regular customer use by different banking institutions. The idea and concept were assimilated by other banks all over the world and currently, major banks in the world have adopted this concept. The account management service allows the users to view their account balances, transfer funds, access, and initiate loans payment without necessarily having to go to the banks. Online bank accounts are capable of offering higher interest rates, particularly on savings accounts, generally lower fees, and quick access to your online accounts 24/7 is a huge benefit for some customers

### Brick and Mortar

In the banking industry "brick and mortar" means that the bank has several physical locations that their customers and users of their products can visit and conduct their businesses. The term refers to the traditional brick and mortar that was used to construct branches using steel and drywalls in the most visible times. They are used by banks and credit unions in Nigeria offering all services, but online services are optional to customers unlike digital-only banks where all transactions are done online. Digital-only banks also referred to as challenger banks or branchless banks unlike brick and mortar have no physical location for banking services, as everything is done on an online platform, they only have a location for admin purposes and hosting of their servers. Unlike digital-only banks they have better communication models as they are considered best in terms of cash deposits, and sending money to international channels (Agu, Simon, & Onwuka, 2016) Online banks are ideally suited to those who want to optimize the return of their savings. Traditional banks typically have a wide variety of offerings to sell to their customers. The greatest downside to brick-and-mortar banks is that online banks do not necessarily deliver the same competitive monetary advantages (Salami, 2018). It lacks new features as it takes a while for some conventional banks to catch up with the technology unlike digital-only-banks where the user has ability to access daily banking functions through computers and mobile devices to cashless transactions. Some features, such as mobile check deposits, are not available at all conventional banks

### Challenges Facing Digital-Only Banks.

Every industry is going to the digital platform and the banking industry is making much effort to cope with the competitive move. Despite digital-only-banks becoming a thing of the day and gaining more popularity, the industry still faces major challenges mostly in developing countries like Nigeria. These challenges are factors that are key stumbling blocks for digital-only banks from stabilizing and being accepted as a banking method for every bank account holder. They include.

1. **Security:** This is among the first factors many customers consider when shopping for a banking option as keeping money safe is always a priority for a customer or any financial body. The sad truth is that internet and computer hackers are still not taking chances when it comes to things on the internet. Having a secure bank and safety of money is a big challenge as IT departments in banks have to design the best system that cannot be broken into by any malicious mind. Digital-only-banks can be a save heaven for hackers if the banking system is compromised.
2. **Scalability:** Digital-only-banks face a huge challenge of scalability with respect to traditional banks. They are efficient but have limited offerings which might restrict customer growth and that personal, one on one and personal interactions is mostly preferred by the older or less digitally savvy generation of the population when it comes to customer service.
3. **Operations of fully digitized banks:** There is a portion of people embracing digital-only banks, although there is a notable number of customers who still have not accepted it as a banking option citing trust issues. It's also quite difficult to convince people about digital-only banks as compared to the existing brick and mortar banks and their operating model. This has made it quite hard for digital banking to achieve 100% success and be completely digitized.
4. **Evolution from ancient banking:** Many people still are not yet aware of digital-only banks as most banking systems are using the traditional COBOL programming language in Nigeria rather than the modern programming languages. This is however an outdated programming language and does not suit the applications that are required in digital banking today. To upgrade these banking systems and install suitable programs is time-consuming and needs a lot of resources for a full digital migration.

5. **The threat of non-financial institutions:** Some upcoming non-financial institutions pose a threat to digital-only banks as they tend to offer products that digital-only banks are supposed to be offering. Facebook in other countries has made it possible for users to send money from one user to the other without involving the bank a technology that might soon be adopted by Nigeria. considering it's not restricted by any financial institution; it becomes hard for these institutions to be in competition with and cope with the stiff competition.
6. **Sustainable competitive advantage:** Among the most crucial challenge affecting digital-only banks are the workload and amount of digital banking initiatives that are increasing daily and have no huge impact on the business due to wrong guidance by the banking professionals. Tarhini, Mgbemena, Trab, & Masa'Deh, (2015). Says that Its however good to carry out a field study when initiating such a project not capitalizing on initiating the products and cost features. Poor experiments by the banks offering digital services have led to poor adoption of the digital products and eventually leading to the initiatives.
7. **Loyalty among traditional banking models:** Despite moving into a post-loyalty era some consumers of the banking products are still tied to the traditional bonds offered by brick-and-mortar products. Sanusi (2010) says that this also presents a challenge when understanding the customer context in terms of the products they prefer as some organizations are experiencing huge problems while trying to superimpose digital solutions to traditional customers who have a little understanding of the products.
8. **Automation and the future of digital-only banks:** Among the most important sociological factor that has been a big challenge in offering digital-only products are their impact and subsequent robotic process. While Nigeria has a proud legacy of large service sectors like mining, oil, and service sector, echoing the digitization of the banking sector needs care as there exist teething problems with other sectors which is an inevitable problem in business.

#### Opportunities.

1. Existence of disc customers. Being in a digital era it's not a big problem to explain technology even in the most remote areas of Nigeria as people have an idea of basic technology that drives our digital offerings. The DISC model describes styles of people namely dominance, influence, steadiness, and conscientiousness. Nigeria has an aggressive and technologically savvy youthful population that can easily access information to inform and educate themselves of the benefits of digital-only banks. Majority of them don not always fit on the traditional banking mold and where they choose to store their wealth.
2. More profits in output. With the use of digital-only banks, there is no more hustle and bustle while waiting for long lines in banks as the upcoming Nigerian generations are predicted to be more digitized as there is a specific time when someone wishes to withdraw money from his/her account from the bank. This will make banks offer a 27/7-hour service to the users of the products hence maximizing their profit margins. (Ojeka, & Ikpefan,2018).
3. A huge pool of customers and fastened services. For any healthy and stable economy money need to be in circulation in a business setting. This is the reason spending long hours in banking halls to transfer money and access loans serve as a disadvantage to the customer and the business itself. By use of digital-only banks, one can transact at the comfort of their homes getting the same speed and utility whether in Abuja or the farthest corner of the country like Okundi plantations in Ikom Local government area of Cross river state.
4. Digital-only banks have a better market prediction. According to Wang, Nnaji, & Jung (2020) the setup of the banks is coded with an excellent programming language that has an accurate data collection mechanism. In any institution, data is very important as it's used by the researcher in predicting the market and offering the most modern service to the customers. Digital-only banks are promising a better banking experience for both the customer and banks hence beyond a shadow of no doubt we can conclude that the future of banking is a digital bank. (Sanusi,2010).
5. Breaking down silos and other mitigating risks. Ojeka, & Ikpefan, (2018) asserts that traditionally banks have been siloed to organizations as different departments have their own organizational goals that use disparate systems. This has inevitably led to stunted growth, limits the bank's scalability while decreasing the utility of their customers as many banks in Nigeria have a reputation of giving their customers huge run around while they are applying for new services.

### AML/CFT Compliance for Digital-only Banks

The central bank of Nigeria amended act of 2007 enumerates the functions and objectives of the country's AML/CFT regime, setting out policies that guide banks to conduct business under the given laws and regulations. Compliance with AML/CFT (Anti-Money Laundering / Combating Terrorist Financing) strict national and international regulations would help digital banks in protecting the platform from fines and reputational harm. Money laundering (prohibition) act of 2012 as amended, terrorism prevention act 2012, economic and financial crime commission act of 2004 gives the standard guidelines that all banks should comply with. Banks are therefore obliged to maintain the highest operating standards to ensure that their services and products are not used for malicious purposes like money laundering, terrorism financing, illicit financial flows and other financial crimes.

Nigeria is no longer on the FATF (financial action task force) list of countries having strategic AML deficiencies as in 2018 FATF welcomed Nigeria significant progress in improving its AML/CFT regulatory framework with no sanctions currently against this country. This makes it a good hub for investors wishing to establish digital-only banks.

In other developing countries like pacific Asia, digital- only banks have been issued licenses for operations upon going through a thorough evaluation process which is the lead in this new frontier of digital services. This can be achieved in Nigeria through the development and execution of an AML/CFT enforcement program and providing qualified compliance personnel with a thorough knowledge of the AML / CFT regulations and comprehension of criminals' changing approaches as per Wang, Nnaji, & Jung, (2020) guidelines.

Even with no presence of physical premises where bank tellers and managers can check their customer identities, digital-only banks are bound by the rules and regulations of digital Onboarding and document verification as presented by any new customers. They must act as per the law by reporting to the regulator any irregularity or any Suspicious transaction as part of AML/CFT compliance. Digital banking licenses are usually subsumed under an existing break and mortar licenses but for the digital-only-banks, the operating licenses is presented as digital-only having no physical location for banking activities.

Referring to (Oladejo, & Oladipupo, 2017) In designing and implementation a well-structured AML/CFT compliance program, the banks are required to have professional, competent and well

qualified compliance officers who have a profound background in understanding the AML/CFT regulations and are aware of the dynamics criminals use in their ever-changing tactics. These officers design risk-based and technological approaches on gathering data, analyzing the data while screening different personalities like politically exposed persons (PEPs), business associates, monitoring Suspicious transactions, watch list screening, and clear observation on cybercrime trends.

To achieve this at 100% success Nigeria banks need to check out the existing AML/CFT controls given, and how they might improve on their operations, evaluate how many employees should be involved in the AML/CFT functions, and what are the related risk that exists in every digital bank sector. By following a non-siloed approach, the AML/CFT functions operate in silos and have their systems to manage suspicious reporting of crime and there's a more effective way to do by using AML/CFT applications with artificial intelligence and machine learning that will inspect huge data volumes for the real-time tracking and PEP screening

AMF/CFT bodies are consistently taking deep research to identify various policies and measures that need to be undertaken to proactively deal with money laundering and threats of money laundering. For our Nigerian case, the government needs to appraise different vulnerabilities and tailor their research to highlighting these weaknesses while considering global standards that are in place for money laundering.

In the (KYC) programs and processes, regulators are obliged to check and update their policy guidelines to help the banks comply with the given rules that pertain to knowing their customers. Nigeria Central Bank and security and future commissions should update their code of conduct while introducing new onboarding rules in a face-to-face manner of capturing the identity of their customers. Referring to Badmus, G. (2019) With an aggressive and robust KYC process, and excellent accuracy tools, digital-only banks are in a position to determine the nature of customer and evaluate who has a high risk of being involved in terrorist financing as well as fraud and money laundering, conduct continuous KYC customer verification with due diligence, be updated on the existing and evolving threats, as well as using analytics in facilitating accurate evaluation. The digital-only Banks' management team need to adverse their media checks in major languages like Ibo, Hausa, Yoruba and other tribes as it enables in search of adverse media and negative news about a personality who may pose a reputational risk to the organization (Oladejo, & Oladipupo, 2017). The key objective is random check to uncover any illegal



activity or criminal who wishes to transact with the organization.

By doing this the economic and social effects of money laundering and the funding of terrorist acts, however, can be avoided and the financial institutions can guard their businesses and the customers with the right attitude and resources, without disrupting business and experiencing reputational harm.

### **Regulatory concerns.**

The banking sector comes with serious problems that have been deeply entrenched in the core financial business model. While digital-only banks offer many benefits to consumers and bankers great risk exist calling for attention of regulators. Financial regulators around the globe have been seeking to ensure that banks and other financial institutions conduct their business in an orderly fashion and professionally to ensure that they do not facilitate illegal activities like money laundering and terrorism financing through their services. In September 2014 JP Morgan admitted that emails, phone numbers, and addresses of 83 million account holders had been accessed by hackers in the world largest security breach. Following the hacking incidence, banks and regulators had to be honest with their customers about the trade-off between convenience and security in digital banking. This move has led to governments imposing strict and more stringent rules known as know your customers (KYC) as well as rules for tax reporting. Such rules have increased the compliance burden to many banks, and asset management companies across the globe as they have to deal with these strict rules which are easy for hackers and malicious experts to bypass. Regulatory barriers and the dominance of major banks are common in other countries, that have dominated mobile finance platforms rather than Telco's, only a few Digital-only banks like Kuda, that have been granted licenses for financial services in Nigeria.

With no legal and explicit regulatory framework that regulates electronic transactions in Nigeria, under the banking and other financial institution act of 2012 the Central Bank of Nigeria is empowered to control and regulate financial transactions in the country. The Central Bank embodies various legislation and supervisory bodies which include Central Bank of Nigeria act of 2007, Nigeria deposit insurance corporation act, companies and allied matters act 2020 and the foreign exchange act. According to Yusuf, & Ekundayo, (2018) these acts gives power and authority to the Central Bank Governor, which was used in 2012 to constitute a technical committee that regulates the conduct of digital and electronic

banking in Nigeria. The committee recognizes that the development of digital and online banking has not been matched with the required regulations and there is a need to address any issue related to the regulator and banking sector. The committee however has issued a document named "guidelines on electronic and digital banking in Nigeria" which has strict rules regarding technology, safety, and security standards. On digital-only banks regulation by the document, it gives clear guidelines which emphasize that networks used for transmission of money must be demonstrated and meet the standard guidelines that are specified for data security and integrity of the user. Banking regulation act requires that no entity can carry out banking operations in Nigeria without a valid banking license under banks and other financial institution act. The document also provides rules that banks will be considered liable for fraud, card skimming, and counterfeit transaction until proven to a shadow of no doubt that the merchant is negligent.

### **Benefits of digital-only banks to Nigerian youths.**

Youth interaction with digital technology at a young age is fundamentally different from that of just the elder generation. Data by UNICEF indicates that 71% of young people in Nigeria are internet users as compared to 48% of the overall internet users in the world. Access to online information and services has become fundamentally important that some countries like Spain, Finland, and France have recognized internet access as a human right. With an ambiguous presence of technology among the youths, this has led to the coinage of the term "digital natives" a term that implies a unique ability to appropriately use digital technology for personal and business use (Badmus, 2019). Financial inclusion to the youths mostly in developing countries like Nigeria in the right context can be an enabler to contribute to their financial empowerment and increase their productivity and well-being. Research indicates that young people form their financial habits and spending patterns as early as the age of 7 years onwards. The prospect of jobs in this sector will be beneficial for the young population which makes up 60 percent of the unemployed people in Africa and young people can take advantage of the opportunities created by the digital revolution (Tarhini, Mgbemena, Trab, & Masa'Deh, 2015). Should mobile users connectivity continue to grow, the user's ability to close the educational gap on the continent will increase.

Digital banks will help a huge population of youth in business and entrepreneurship as it will conveniently and affordably connect entrepreneurs with the bank, the supplier of goods and also penetration into new markets which prefer digital payments (Yusuf, &

Ekundayo, 2018). By using such modern systems, the youths will be in a position to accelerate their business, register other online branches, as well as cost reduction due to traveling and incurring other logistical costs.

Digital-only bank services will help Nigerian youths improve on their savings models as well as access and payment of loan facilities which can be a major boost to their businesses. This is supported by fact that digital loan payment automatically provides the user of the bank with a credit history which gives them access to higher credit facilities.

Digital-only banks will give youths in marriages and entrepreneurship great control over their cash flows and incomes potentially benefitting their business and entire households especially in the micromanagement of funds for budgets and children.

### Conclusion.

Regardless of its path to growth in Nigeria and other parts of the world, digital-only banks have multiple challenges and opportunities that must be addressed to cement its operations in local and international financial landscapes. Banking services and solutions have changed drastically as automation is currently the biggest focus that banks are concentrating on as technology is increasingly growing. With the convenience and economic advantage of digital-only banks, as experienced by the consumers, its market share in Nigeria is gaining traction and over time customer satisfaction will lead to better scalability. Regulators have done incredible job in making Nigeria a good business hub for investors in banking technology. Embracing digitization of banking services from a traditional model to digital-only banks, in our country Nigeria, it will create a good space for enhanced and convenient customer services, reduce human effort and error, helps save time and resources as well as building loyalty to the customers. Nigeria as a developing country and the establishment of digital-only banks will revolutionize the Nigerian market, create employment and jobs for the youth of Nigeria, decrease the unemployment rate, create space for banks expansion through reduced cost of

doing business, and in the long run boost the economy of Nigeria to a developed country.

### Recommendations

Nigerians are fast learners and quick to adopt technology, and such an aggressive attitude present a good investment hub for investors in digital ecosystem and value adding solutions to financial service providers. Nigeria having a stable economic fundamental, internet connectivity, good regulatory climate and easily accessible technology can propel digital-only- banks adoption as transformation is no longer an option but a must considering the fact that 80% of global banks are already implementing digital transformation programs. This comes at a time when the world financial sector is at the heart of growing wave of technological transformation and digital-only banks have a great future in the banking industry despite the challenges presented by their establishment. Better conditions for the bank can be achieved through moving from functional quantity to quality design quantity, creating seamless multichannel experiences, a well-structured end to end customer onboarding, removing internal silos, and increasing customer values with the digital-only bank services. Its however important to consider that in the digital era almost every online transaction needs KYC compliance, from banking, forex bureau to gambling operators as per the law. For successful running of digital-only- banks healthy and working atmosphere, the desired outcome is that all obliged entities entering the market accurately identify their customers with valid licenses given by regulator as digital only with no physical locations. A critical element to successful AML/CFT outcome is individual risk assessment at the organizational level and at the level of account opening. The standard procedure is the core of identification with AML compliance as well as clarification and codification in order to provide a stable working environment and for the benefit of customers and regulators. With absence of adequate and legal regulatory measures to address all associated risk and challenges of digital-only banks, it might hinder customer trust and confidence in using this digital banking products and services.

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## Does Technological Innovations Affect Unemployment in Nigeria?



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### ABSTRACT

*This study examines the effects of technological innovations on unemployment in Nigeria using annual time series data 1980-2018, Autoregressive Distributed Lag and cointegration bound testing approach. Technological innovations was proxied by the inflow of FDI; importation of Machinery and Equipment as indicator for process innovation (ETC), Patent represents product innovation, while Total Factor Productivity serves as the exogenous technical progress in line with Solow. The result shows that the coefficient of the Inward Foreign Direct Investments (INFDI) is positive (3.85), which is significant at 5%, indicating a strong positive effect of process innovation on Unemployment. Machinery & Equipment was also positive (2.87) and it's significant at 5%. However, Patent (-1.20) has a negative and significant effect on unemployment. By implication, process innovation (with Embodied Technological Change, potentially substitutes labour), therefore, raises unemployment, while product innovation reduces unemployment in Nigeria. There is need to invest more on in-house innovation via R&D activities by, upgrading the learning and skill acquisition standard of the country, and also supporting innovative ventures through discoveries, mentorship, provision of capital and macroeconomic stable environment.*

**Keywords:** Technological innovation, Process innovation, Product innovation, Unemployment, ARDL

**JEL:** Classification: E24, O33

### INTRODUCTION

#### Background to the Study

The world marketplace has taken a new turn with the advancement of technology. Technological innovation has changed the nature of production and trade, as Industrialization is gradually becoming more capital-intensive, largely due to the discoveries of machineries and technology, as such, has an overwhelming effect on the labour force. New economy emergence has been characterized by increase in productivity and output level, largely driven by progress in technological innovations and inventions.

Innovation on its' own is a broad concept which allows for the development of extra or additional steps to increase production in stages. It is the ability to introduce or develop new ways of production of products and services which are useful for accomplishing goals and objectives. It is also a new process of achieving an old task. Therefore, technological innovation is the technological aspect of innovation which emphasizes the use of technology as the key determinant of growth. In the business world, technological innovation is simply a new and improved way of achieving or accomplishing traditional tasks. Conventionally, the most important source of growth in economics is technological change (Todaro & Smith, 2013). The invention of new technology is a form of technological innovation; progress in technology changes the process of production of firm's overtime (Perloff, 2012).

*Technological change is a series of stages with multiple actors, relationships and feedback loops-from the invention, as new technology is created and prototyped, to innovation as it becomes commercially viable (UNIDO, Industrial Development Reports, 2011)'*

A large percentage of the growth and increase in productivity across the globe is accounted for by improved technological innovation. An undeniable fact is that technology makes production easier, faster and less costly when compared to human ability, with regards to some cognitive and routine jobs. Technological change is revolutionary with each phase significantly impacting on the world economies both positively and negatively. Developed countries have mostly utilized the transformational benefits embedded in technological innovation. China, for instance, is considered as the 'future market' by 2025, and Germany remains one of the key drivers of growth and development of the European economy. Technological innovation can be divided into four

main types, according to (Oslo Manual, 2005) they are Product innovation, Process innovation, Marketing, and Organizational innovation. However, the study focuses on determining the connection between technological innovation and unemployment, hence, the main concern is the first categories: product and process innovation. Product innovation: is described as the birth, evolution and emergence of new breakthroughs, products, goods and services. (Matuzeviciute, Mindaugas, & Karaliute, 2017). Product innovation improves lives and allows for ease (Ramanauskienė, 2010). A good example of product innovation is the ATM machine, telegraph, mobile phones, cars, etc. It opens new opportunities and a great chance for progress.

Process Innovation: this involves a new method, new technologies and new ways of production of goods and services. It is a new and improved way of performing an old task to achieve a better result and enhance overall performance. Automatic data processing and recording have replaced the old-fashioned way of 'back office' activities. Also, the increased use of artificial intelligence and robotic use are parts of the process innovation of technological growth. Robots tend to be more precise than humans and cost less in the long run (Brzeski & Burk, 2015). Robots designed for production have self-learning abilities. These further stresses the importance of innovation, research and development, and technological advancement for economic growth and development. What distinguishes the economies of developed and developing countries is 'technological innovation'. Technologically advanced countries continue to sustain and improve their economies especially, entrepreneurship by developing internal technology, suitable for the economic condition.

A good example is Singapore, which has been established as a hub for innovation and entrepreneurship and ranked by World Bank as number one with ease of doing business in the world. Singapore as a country has developed a technology plan which spans for five years, the most recent was developed in 2016-2020, with \$19 billion budgeted for research and technological innovation up from \$16.1 billion from the previous year. (EEN, 2019). Singapore has succeeded in proving that technological innovation may not necessarily lead to unemployment given that the unemployment rate is about 0.8% in 2018 and in 2017, it was 0.7%. This is still not far from the natural rate of unemployment in economics.

Most developing countries, on the other hand, keep relying on FDI, (foreign direct investment), that is, most Developing Countries (DCs) import technologies via investment in machinery and capital goods and foreign investments into their countries. The

importation of technology hinders development in the long run thereby depriving the home country of the opportunity to be self-sufficient and self-reliant. It requires more capital and hence, leads to an increase in the unit cost of production which increases the prices of the final goods and services. Certainly, the future of the product markets and the labour markets depend largely on the impact of technological development in years to come (as it has been) (Solow, 1957) (Romer, 1990). For countries to compete internationally and increase productivity and economic growth, their level of investment in technology through R&D activities will influence their performance. In this digital age, every economy is a product of her level of research and development, innovation and technology. Modern economies and productivity are dependent on technological input and other factors of production. It is widely believed that, although improvement in digital technology results in high productivity, a contrasting view still holds of its' detrimental effect on the future of the labour market, with respect to the sustainability of the human labour, job security, and the future of employment of the generations to come.

Empirical findings on how technological innovation affects employment are disintegrating. Some researchers have identified the second-order effect of technological innovation which creates new products and new demand, thereby creating new jobs (Miller & Atkinson, 2013) (Harrison, Ruperti, Jaumandreu, Mairesse, & Peters, 2008) (Vivarelli, 2014). On the other hand, others argue that although advancement in technology aids production by making it faster and easier, it will result in technological unemployment (Matuzeviciute et al 2017) (Keynes, 1933). Globally, advancement in technology has taken a new turn with the advent of the fourth industrial revolution (Industry 4.0).

There is the fear of job displacement in this era, which as a result of innovations, which can be described as daunting, and has received global attention in modern times. More evidently, the fourth industrial revolution might represent Schumpeter's 'Creative Destruction'. In Germany, the launching of the 4th Industrial revolution, (Industry 4.0) has birthed a new dimension of research, with a focus on Robots. The growing concern is the effect of robotization on employment: Recent studies confirm the use of robots in carrying out tasks that were conventionally performed by humans both in the workplace and at the home front (Brzeski & Burk, 2015).

Since the cyclical nature of an economy includes recession at one time and boom at another, job creation and destruction are therefore inevitable, and part of the economy's reaction to change. In developing countries, one major characteristic that is similar to all is that job growth remains stubbornly

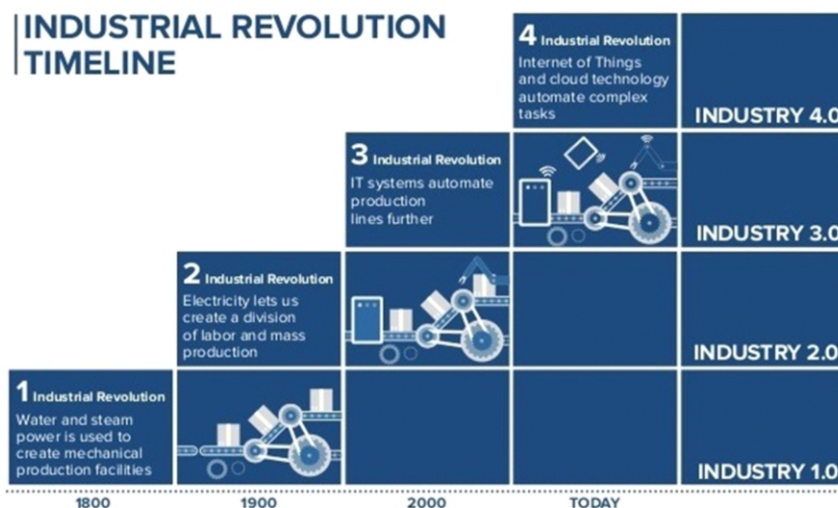
anemic. The general belief since the time of the Neo-Luddite is that technological change affects job growth. In their opinion, the advancement in technology is the cause of job destruction which results in technological unemployment. The advent of the first industrial revolution was rejected by the English workers back in the days, emphasizing that machines and other equipment must be destroyed to protect the labour market. Furthermore, Low-income countries are more susceptible and vulnerable to automation compared to high-income countries (Millington, 2017).

The risk of automation is higher; likewise, the effect on demand for labour will be altered if the right technology is not employed. In the 19th and 20th century, automation and computerization bolstered job creation. During this period, technology was more of a complement than a replacement of labour, hence, enhanced development overall. For example, In Nigeria, the advent of Global System of

Mobile Telecommunication (GSM) and the internet contributed immensely to trade and general productivity of the economy, by easing the pressure of communication between the buyers and sellers.

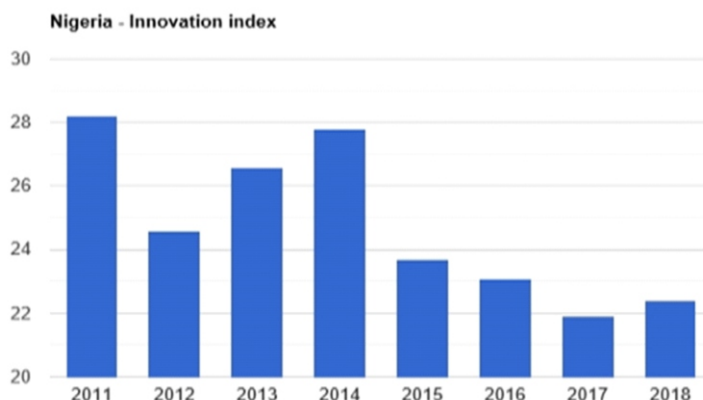
In addition, the fact that digitalization and computerization may result in job destruction in the future in an unprecedented way is the main concern of the 'techno-pessimistic' group of people. This is because the innovations of the 19th and 20th century complemented labour in a commendable way. But the same cannot be said of the twenty-first (21st) century technological innovation, which is more labour-saving than labour-augmenting. An in-depth review of the Industry 4.0: 'The Fourth Industrial Revolution' justifies the opinion of techno-pessimistic of a paradigm shift from the first through the third industrial revolution, to a revolution characterized by a fusion of digital, biological, and physical technological spheres (UNIDO, 2018).

Figure 1: Industrial Revolution Timeline



Source: Daxue Consulting 2019

Figure 2: Nigeria- Innovation Index



Source: TheGlobalEconomy.com, Cornell University, INSEAD and WIPO 2019



Undoubtedly, Nigeria has a long way to go in embracing the concept of innovation in totality, especially, product innovation which has been established to bolster job creation globally. However, there is emerging evidence of new technology gaining grounds. Therefore, given that the pace of technological development is radical, and the high percentage of jobs at risk in the country presently, how prepared is Nigeria for technological unemployment? Will technological innovation enhance or substitute labour in Nigeria? Is technological advancement a threat to the Nigerian labour force? Can the persistent rise in unemployment be attributed to technological change? If the new innovation and technology become cheaper, are we prepared for the future? The past and present literature on whether, technological innovation complements or substitutes labour is highly 'controversial'.

It is a tenet that has remained debatable and inconclusive. Many scholars believe that technological advancement results in mass job destruction, See (Stuart, 2007), (Lanier, 2013) (Frey & Osborne, 2017), (Arntz, Gregory, & Zierahn, 2016), (Acemoglu & Restrepo, Robots and Jobs: Evidence from US Labour Market, 2017) (Citi, 2016); others believe that technical change is skill-biased, hence results in polarization of the middle-skill jobs, thereby leading to inequality, (Dachs, 2018) (Santos, 2016). On the other hand, the majority believe that advancement in automation and technology are no threat to employment, on the contrary, robots, machine productivity and automation are key drivers of human progress, (Miller & Atkinson, 2013) (Pankaj, 2018) (Danaher, 2017) (Piva & Vivarelli, 2018) In contemporary research studies, the issue of technological advancement and labour saving is 'inconclusive', that is, technological innovation is neither good nor bad on employment, wages and human labour at large (Acemoglu, 2010) (Michael et al, 2017).

In the case of Developing Countries like Nigeria, innovation has been characterized by more of Embodied Technological Change (ETC) than R&D given our overdependence on importation as well as our taste for foreign goods. Therefore, following the recent studies of (Matuzeviciute, Mindaugas, & Karaliute, 2017), (Bogliacino, 2014) (Dahlman & Chen, 2004), this study examines and assess the relationship between the unemployment and technological innovation in Nigeria, with focus on whether or not increase in technology has substituted or enhanced labour in Nigeria. The study will further examine the effects of product and process innovation on unemployment growth rate in Nigeria.

The Keynesian school of thought also raised concerns about the widespread technological unemployment by Keynes. According to Keynes,

*"Due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour" (Keynes, 1933).*

The Keynesian school of thought holds that the discovery of new machinery will possibly destroy the relevance of human labour by displacement of jobs initially performed by a human. Keynes postulations on technological innovation created the awareness of the discovery of machineries that accelerate and enhances productivity, however, might result in detrimental effect on the labour force.

Similarly, there is increasing evidence that the labour markets are hollowing out. According to (Frey & Osborne, 2017), using the occupation-based approach to test for the susceptibility of jobs in the US, the result shows that about 47 per cent of occupations in the US are potentially automatable to replacement by automation, a projection for the next 10 to 20 years to come. Results from a cross-country occupational structure differences shows that about 35.7 per cent of Finland corresponding share of employment is at the high-risk of automation (Pajarinen & Rouvinen, 2014), out of a total of 30.9 million social insurance companies estimated in Germany labour force, 18.3 million of the jobs which were marginally employed in the analysis stands a high-risk of automation of about 59% (Brzeski & Burk, 2015).

## METHODOLOGY

### Sources of Data and Methods of Data Analysis

This study, employed secondary data which were sourced from: the National Bureau of Statistics (NBS), World Development Indicators (WDI) (World Bank, 2019)E, Penn World Table version 9, (Robert, Robert, & Timmer, PWT 9.0, 2015), Federal Ministry of Trade and Investment, and the Global Economy (The Global Economy, 2019). The variables employed for the study are:

- i. Unemployment growth rate (percentage of the labour force)
- ii. FDI (foreign direct investment(inflow)) (BOP current US\$)
- iii. PA (Patent) (Total number of registration)
- iv. TFP (Total factor productivity in rate)
- v. M\_E (Machinery and Equipment importation in million Naira)

The unemployment growth rate is the dependent variable; it represents the total percentage of the labour force that is willing and able to work but couldn't get jobs. If the result shows a negative coefficient, then innovation reduces unemployment, hence, and it's therefore a complement; however, if it's positive, then it's a substitute. The FDI is one of the ways through which developing countries experience the transfer of technological innovation into their countries, via importation of capital and intermediate goods, machineries and equipment, and other capital imports. It is a part of the Embodied Technological Change (ETC) as explained by (Barbieri, Piva, & Vivarelli, 2016) particularly for DCs. Hence inward FDI

could also proxy for process innovation in developing countries.

The patent which was described as the output of research and development activities; it is a variable of choice because it is one of the commonly used proxies for technological innovation by researchers. Patent and Intellectual Property Rights are being considered as the best way to measure technological diffusion and innovation, see (Jalles, 2010). Total Factor Productivity (TFP) is another proxy for innovation and has been included in this study based on (Solow, 1957) findings, it accounts for the technological progress which is determined exogenously.

**Table 1: The summary of the model is given below:**

Variables	Definition	Measurement
<b>Dependent Variable</b>	Unemployment (unemploy)	Total (% of labour force)
<b>Independent variables</b>	Inward Foreign Direct Investment(FDIin	BOP current US\$
	Patent Registration	Total Number registered per year
	Machinery and Equipment (M_E)	Million Naira
	Total Factor Productivity(CTFP)	TFP at constant national prices (2011=1)

Source: Author's computation (2019)

**The model specification in a log linear form for long-run is given as:**

$$UN_t = \alpha_0 + \alpha_1 PA_{t-1} + \alpha_2 LnFDI_{t-1} + \alpha_3 TFP_{t-1} + \alpha_4 LnM\_E_{t-1} + \mu_t \tag{1}$$

Where: UN = Unemployment rate, PA = Patent, InFD = Foreign direct investment inflow, TFP = Total factor productivity, M\_E = Machinery and Equipment,  $\alpha_0$  = The intercept, while  $\alpha_1 - \alpha_4$  = the slope,  $\mu_t$  = the random error

The ARDL estimation technique is a linear analytical tool used for time series models which specify the contemporary and the historical relationship between the endogenous and exogenous variables. The ARDL models are also well known for examining the cointegrating relationships among variables (Pesaran & Shin, 1998), irrespective of their orders of integration  $I(0(1))$ .

The model was analysed using ARDL cointegration technique. This ARDL method of estimation is preferred having satisfied the  $I(0)$  and  $I(1)$  condition among the series.

Short-run RECM (Restricted Error Correction Model) is given as:

$$\Delta UN_t = \alpha_0 + \omega E\hat{C}T_{t-1} + \sum_{i=1}^q \alpha_i \Delta UN_{t-1} + \sum_{i=1}^{p_1} \beta_i \Delta PA_{t-1} + \sum_{i=1}^{p_2} \gamma_i \Delta TFP_{t-1} + \sum_{i=1}^{p_3} \delta_i \Delta \ln FDI_{t-1} + \sum_{i=1}^{p_4} \psi_i \Delta \ln M\_E_{t-1} + \ell_t \tag{2}$$

While the UECM (Unrestricted Error Correction Model) is given as:

$$\Delta UN_t = \alpha_0 + \sum_{i=1}^q \alpha_i \Delta UN_{t-1} + \sum_{i=1}^{p_1} \alpha_2 \Delta PA_{t-1} + \sum_{i=1}^{p_2} \alpha_3 \Delta TFP_{t-1} + \sum_{i=1}^{p_3} \alpha_4 \Delta \ln FDI_{t-1} + \sum_{i=1}^{p_4} \Delta \ln M\_E_{t-1} + \beta_1 UN_{t-1} + \beta_2 PA_{t-1} + \beta_3 TFP_{t-1} + \beta_4 \ln FDI_{t-1} + \beta_5 \ln M\_E_{t-1} + \mu_t \tag{3}$$

Theoretically, process innovation, (ETC) via investment in capital equipment and machinery which is mainly imported through the mechanism of FDI (inflow) and is expected to have a positive relationship with unemployment; Product innovation (proxy by patent) is expected to reduce

unemployment, while process innovation increases unemployment. Total Factor Productivity (TFP) measures the residual growth, explains the long-run growth of the economy, and accounts for progress in productivity, it is expected to relate with unemployment negatively.

## RESULTS AND DISCUSSIONS

Table 2: Augmented-Dickey Fuller Unit Root Test (Summary)

Variable	Stationary	Order of stationary	Significance level	Probability
<b>Unemployment</b>	Yes	I(0)	5%	0.0142
<b>FDI inflow</b>	Yes	I(1)	1%	0.0000
<b>Patent</b>	Yes	I(1)	5%	0.0000
<b>M E</b>	Yes	I(1)	1%	0.0000
<b>Total Factor Productivity</b>	Yes	I(1)	1%	0.0000

Source: Author's Computation (2019) (Eviews 10SV)

The Augmented Dickey-Fuller unit root test shows that none of the five variables have unit root. variables are integrated of order I(0) and I(1) (see Table 2). The analysis has been done at the Aggregate/ Macro level; hence we are testing the overall effect of innovations on labour using unemployment. In Table 3, the ARDL estimation result shows that the coefficients of the Inward Foreign Direct Investments (INFDI) are positive (3.85), with the probability value of (0.0000) indicating a strong positive effect of process innovation on Unemployment. While that of Machinery & Equipment is also positive (2.87), with a P-value of (0.0014) showing a statistical significance of having a

positive impact on unemployment in Nigeria, and significant at 1%. Patents, on the other hand, have a negative and significant effect on unemployment. The coefficient of the patent is (-1.24), with a probability value of 0.0478 indicating a statistical significance at 5%. The effect of TFP as a proxy for innovation is mixed. For the current year and the first lagged period, result shows that there is a negative relationship between unemployment and TFP, (-1.2, -0.03), however, not significant, (given the P-value of 0.52 and 0.99 respectively), while the coefficient of the second lagged period is negative (-17.85), and significant at 1%. TFP for the third lagged period has a positive coefficient and not significant (see Table 4).

Table 3: ECM Regression Result (Short run analysis)

Variables	Coefficient	Std. Error	t-Statistic	Prob*
D(UN(-1))	4.255835	0.469726	9.060256	0.0000
D(UN(-2))	2.613900	0.371440	7.037200	0.0000
D(CTFP)	-1.359484	1.399856	-0.971160	0.3544
DCTFP (-1))	15.939191	2.440192	-0.940166	0.0001
D(CTFP (-2))	-1.940621	2.064126	-0.940166	0.3693
D(LNFDI)	3.898749	0.334092	11.669694	0.0000
D(LNFDI(-1))	3.370343	0.535176	6.297630	0.0001
D(LNFDI(-2))	3.593022	0.550160	6.530863	0.0001
D(LNM_E)	2.612343	0.443259	5.893486	0.0002
D(LNPA)	-1.248309	0.285772	-4.368204	0.0014
CointEq(1)*	-5.959384	0.649734	-9.172030	0.0000

Cointeq = UN - (-2.8829\*CTFP + 0.1332\*LNFDI + 0.5138\*LN\_ME -0.2157\*LNPA + 2.7364)

Source: Author's Computation (2019) (Eviews 10SV)



**Table 4: the ARDL Estimation Results**  
**Dynamic regressors (3 lags, automatic): 3 (Automatic selection)**

Variables	Coefficient	Std. Error	t-Statistic	Prob*
UN (-1)	-0.600120	0.281849	-2.129226	0.0591
UN (-2)	-1.616634	0.429180	-3.766799	0.0037
UN (-3)	-2.362768	0.820543	-2.879517	0.0164
CTFP	-1.289368	1.937446	-0.665499	0.5208
CTFP (-1)	-0.031525	2.598596	-0.012132	0.9906
CTFP (-2)	-17.85359	4.247951	-4.202850	0.0018
CTFP (-3)	3.089202	2.419910	1.276577	0.2306
LNFDI	3.854944	0.531331	7.255259	0.0000
LNFDI(-1)	-0.004913	0.640807	-0.007667	0.9940
LNFDI(-2)	0.159177	0.553858	0.287397	0.7797
LNFDI(-3)	-3.266146	0.703969	-4.639614	0.0009
LNM_E	2.866870	0.654495	4.380275	0.0014
LNPA	-1.203407	0.533827	-2.254300	0.0478
C	15.2673	16.19734	0.942619	0.3681

R-squared	0.982016	Mean dependent var	10.54775
Adjusted R-squared	0.958638	S. D. dependent var	2.889029
S.E. of regression	0.587563	Akaike info criterion	2.065531
Sum squared resid	3.452303	Schwarz criterion	2.752730
Log likelihood	-10.78638	Hannan-Quinn criter.	2.247845
F-statistic	42.00472	Durbin-Watson	1.941776
Prob(F-statistic)	0.000001		

Source: Author's Computation (2019) (Eviews 10SV)

The result also reveals that the Total Factor Productivity (CTFP) which according to (Solow, 1957) represents technological progress has a negative impact on unemployment, but not significant. The coefficient of the TFP is (-1.289) with the probability value of 0.5208, which indicates its' insignificance statistically. Recall that TFP is described as an indicator of 'Technical Change' which accounts for the short-run and long-run economic growth (Solow, 1957), and has been proven empirically to reflect actual technological growth (*ceteris paribus*) (Ceyhun & Cakir, 2014).

More so, evidence from the regression reveals that there is a strong and positive relationship between unemployment and inward FDI. A unit increase in the inflow of FDI into the country increases unemployment by 39%. This conforms to the a priori expectation, however, this is in contrast with the findings of (Matuzeviciute, Mindaugas, & Karaliute, 2017) (Lipse, Sjolholm, & Sun, 2010) (Fieldmann, 2013) that reveal that inward FDI is negatively related to the unemployment growth rate.

Perhaps, the difference in these findings can be attributed to the development stage of the countries sampled, as well as the macroeconomic structure and its' effect on the labour force. Most of these empirical results are estimated on technologically advanced countries that invest heavily on in-house innovations hence, a negative effect is expected.

However, in the case of DCs, as earlier established empirically, for most DCs, the dominant form of technological innovation is the Embodied Technological Change (ETCs) via importation new technologies (Capital goods, machinery and others) from developed countries (Vivarelli, 2012).

In general terms, since most of the technologies are imported, we can imply that technological spill-over and 'Catch-up' substantially account for innovations in DCs, therefore the predominant source is the process innovation which has a productive but job destruction effect on the host countries.

The result of this study further justifies the predictions of (Vivarelli, 2015) (Vivarelli, 2012), that process innovation results in technological unemployment, as it is the case of Nigeria, there is a strong positive relationship between inward FDI (Proxy for technological innovation) and unemployment.

As FDI inflow increases by one unit, the unemployment rate in return increases by 3.85 units. Patents which represent the output of R&D activities in the country as described by (Vivarelli, 2015), and been considered as the reflection of product innovation which has the job-creation effect, has been justified from the regression results. In other words, patent activities relatively in Nigeria have a complementary impact on labour. A unit increase in patent activities results in about 1.2-unit reduction in

unemployment in Nigeria. Finally, importation of machinery and equipment which also represents the Embodied Technological Change (ETC) justifies the job destruction effects of process innovation. The regression result shows that a unit increase in the importation of Machinery increases the unemployment rate by 2.87 units and is statistically significant at 1% level of significance.

### Summary and Conclusion

This study examines the impact of technological innovation on unemployment in Nigeria. The primary focus of the study is to determine if technological change complements or substitutes labour in Nigeria. Findings suggest that the effects of technological innovation on the labour force are two folds: positive and negative, and these effects are influenced mainly by the type of technological innovation employed at that time. The results show that technological innovation can lead to "technological unemployment" Product innovation, on the one hand, enhances labour while process innovation on the other hand potentially renders labour obsolete.

Technological innovation can be detrimental to the economy either directly or indirectly. The impact of technological innovation on labour and social growth of the country depends on the type of technological innovation, the economic institutional mechanism, structure of the country, the channel through which innovation is produced and acquired, human capital development, and a host of others. Economic research have revealed that as profitable as technological innovations might be to productivity and development, they are not void of consequences. One major consequence of innovation is the direct effect on employment, which has been identified as "Technological Unemployment (as earlier discussed).

Therefore, in this study, we have contributed to the existing literature on the debate about the impact of technological innovation on unemployment. Most empirical research has been carried out at the micro-level and the sectoral level, only a few pieces of research have been done on the macroeconomic effect of innovation on unemployment. Findings also are divergent on the results, while some suggest a strong positive impact, (Fieldmann, 2013), some findings reveal that there is no clear evidence on the impact of innovations on unemployment (Matuzeviciute, et al 2017).

However, the regression results indicate that overall, there are short and the long-run relationship between technological innovation and the labour force, technological innovations, can have both

positive and negative impact on the labour force, depending on the type of innovation. In quantitative terms, process innovation (proxy by inward FDI and importation of M\_E) has labour-saving effects on the labour force in Nigeria, hence a substitute. While product innovation (proxy by patents) has a labour-augmenting effect on the labour force in aggregate terms, hence, a complement.

### Recommendations

Technological unemployment can be avoided if the focus is more on labour-friendly innovations, rather than labour-saving. This is possible when in-house Research and Development activities (R&D) are encouraged at all levels. This will bolster job creation by enhancing the introduction of new products, firms and jobs.

Secondly, with regards to inward FDI, the introduction of new technology, as well as the importation of equipment and machinery, might be a key contributory factor to the upsurge of unemployment in most developing countries. More so, evident in the analysis is the sign of the positive effect of inward FDI on unemployment in Nigeria, these results underscore the need to stimulate innovation activities aimed at providing, increasing and stimulating employment in Nigeria.

Given the creative destruction effect of the introduction of new Embodied Technological Change (ETC), technology adaptation rather than outright adoption is more suitable for Nigeria. In other words, it is a fact that importation of technology is a crucial driver of technological innovation in Nigeria, however, adapting and modifying these new technologies will be instrumental in minimizing its' labour-saving effect.

Conclusively, the economy cannot thrive without technology, it is therefore expedient to carefully select the best type of technology most suitable for a country like Nigeria, with high level of youth unemployment. Advancement in technology is ever-increasing, but its' maximum impact is time-bound (World Trade Reports, 2017).

The wave of technology from the first up to the third industrial revolution has had long-lasting effects on production, but full manifestation took a while, implying that the current wave of technological progress, especially the most feared fourth industrial revolution is perceived to have a potentially destructive nature, and at the same time, make production easier, faster, and cheaper. Therefore, the effect of technological innovation is ambiguous.

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APPENDIX

**Table 5: VAR Lag Order Selection Criteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-45.22429	NA	3.871609	4.185357	4.430785	4.250469
1	-40.39590	7.242581	2.827162	3.866325	4.160838	3.944459
2	-39.71404	0.965962	2.922386	3.892837	4.236436	3.983994
3	-34.76760	6.595262	2.122447*	3.563966*	3.956651*	3.668146*
4	-34.70453	0.078828	2.322455	3.642044	4.083815	3.759246

\*indicates lag order selected by the criterion

**Table 6: ARDL Long Run Form and Bounds Test Results**

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
<b>Asymptotic: n=1000</b>				
F-statistic	11.77308	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
<b>Actual Sample Size 24      Finite Sample: n=35</b>				
		10%	2.46	3.46
		5%	2.947	4.088

Source: Author's computations (Eview 10SV) 2019

Post Diagnostic Tests

**Table 7: Breusch Godfrey Serial Correlation LM Test:**

Null hypothesis: No serial correlation up to 2 lags

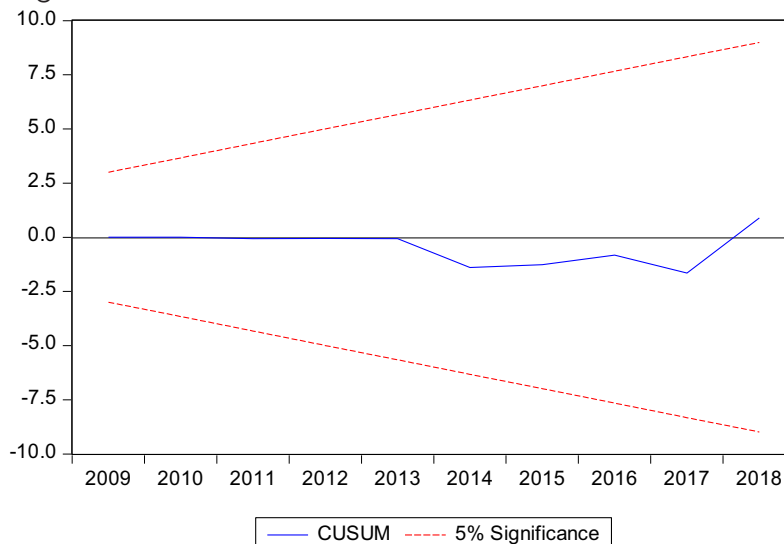
<b>F-statistic</b>	<b>0.173198</b>	<b>Prob. F(2,7)</b>	<b>0.8440</b>
<b>Obs*R-squared</b>	0.996058	Prob.ChiSquare (4)	0.6077

**Table 8: Heteroskedasticity Test: Breusch-Pagan-Godfrey**

Null hypothesis: Homoskedasticity

<b>F-statistic</b>	<b>3.010057</b>	<b>Prob. F(18,4)</b>	<b>0.0440</b>
<b>Obs*R-squared</b>	19.11507	Prob. Chi-Square (18)	0.1196
<b>Scaled explained SS</b>	2.839293	Prob. Chi-Square (18)	0.9985

Figure 3: CUSUM Tests





## Board of Directors' Structure and Corporate Tax Aggressiveness of Listed Industrial Goods Companies in Nigeria



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### Abstract

Taxation plays a vital role in financing all government projects and activities, as such, the studies of tax aggressiveness can assist policy makers and tax authorities in addressing companies' illegal tax schemes and taxing business more equitable in the sense that every entity pays their fair share of taxes. The study examines the effect of board structure on tax aggressive of selected industrial goods companies listed in Nigeria Stock Exchange from 20016-2020. Data were obtained from annual report and account of the companies under investigation. Descriptive statistics, ordinary least square regression technique were used to estimate the model. Hausman's specification test was also conducted to choose between fixed and random effect, the test favoured random effect over fixed effect. The result reveals that firm size (FSZ) and leverage (LEV) are negatively related to tax rate while board size (BSZ), independent directors (IND) and return on equity (ROE) are positively related to tax rate. It was also found that an independent director (IND) was statistically significant at 1% level, while board size (BSZ) was negatively insignificant. The study concluded that board size (BSZ) has significant role to play in reducing tax aggressiveness of listed industrial goods in Nigeria and as such the study recommends that regulatory bodies should enforce strict compliance to the provisions of the codes of best practices by Nigerian companies.

**Key words:** Tax aggressiveness, board structure, return on equity and industrial goods,

### Introduction

Taxation plays a vital role towards the development of Nigerian economy. It provides revenue for government to finance all the activities, ensures resources redistribution, and generates employment. Payment of tax is a civic duty and an imposed contribution by government on her subjects to enable her finance or run public utilities and perform other social responsibilities. Given this, tax system serves as a fiscal tool used by governments all around the world to achieve her primary objectives such as infrastructural development, enhanced security, ensuring economic growth and sustainable development (Bebeji, Mohammed and Tanko, 2015). Although, there are a lot of anti-avoidance laws in most of the countries around the world, however, companies do employ tax experts (tax accountants) to help them in the preparation of false financial statement in order to pay less tax to the authority concern. (Babayo, 2017)

Desai and Dharmapala (2006) opined that tax aggressive planning involves some levels of obfuscation and complexity to prevent its detection. Thus, if a firm opts for it, it gives room for managers to divert the firm's resource and low level of tax enforcements. Therefore, corporate tax aggressiveness seems to be one of the most challenging issues of our generation as it exposes a company to technical tax and reputational risk; and also represents a serious loss of revenue to the government. Recently in (2017), there was a lot of malpractices by corporate bodies were by companies adopted different aggressive ways to reduce their tax obligations. This became an alarming cry as the problem of tax aggressiveness (avoidance) bedevilled the tax system of both developed and developing countries. (Mustapha and Nasir, 2018)

The effort made by the government on the implementation of tax laws in Nigeria proved abortive as corporate tax departments were tuned as a profit centre managing a portfolio of tax issues with significant emphasis on minimising the amount of tax to be paid. For instance, in the famous Enron case the company's tax department had been turned into a revenue centre, having its annual target. It was then revealed that when a company is being taxed aggressive, investors may not be the benefactors as the complicated transactions and professional cost used to avoid taxes were so expensive and cost the company much. As a result, the investors actually do not benefit (Martinez, Ribeiro, & Funchal, 2015). It was also an issue of increasing concern to several parties in the UK, due to the fact that tax planning potentially had a

negative effect on the level of provision of public goods which then contributed to lots of social issues (Hanlon & Slemrod, 2006).

Furthermore, the lack of tax governance-related information made shareholders value tax planning differently. It is generally expected that shareholders prefer tax aggressiveness since ordinarily paying less tax implies that the firm saves money for its shareholders. This may lead to agency problems as the (board of directors) may not align with the shareholders (investors), thereby making the tax issues complicated (Duke, & Kanlpang, 2011).

As the proliferation of corporate scandal gain its stead in business operations across the globe, investors gradually lost confidence in the Capital Markets. As such, Hanlon, and Slemrod (2006) asserts that on the average, a company's stock price declines when there is news about its involvement in tax aggressiveness. This led to great loss of investment by investors' as stock prices gradually declined from a bullish state to a bearish status. Also, Klein and Leffler (1981) argued that customers and suppliers might become wary of dealing with such firms associated with tax aggressiveness, thereby increasing future transaction costs and perhaps causing customers and suppliers to deal with other companies. This is because, engagement in unknown aggressive activity could head to prosecution and associated costs (Khurana, & Moser, 2013). Desai and Dharmapala (2009) opined that tax aggressiveness may signal dishonesty been extended to the financial accounting statements.

It is against this background that the study undertakes with a view to evaluate the effect of board of directors on the corporate tax aggressiveness of listed cement companies in Nigeria. The study is significant in the sense that it would be of immense benefit not only to the companies in the Nigerian industrial sector, but also to the Nigerian economy in its entirety in improving tax aggressiveness, enhancing value driving performance for company's survival and in evaluating investment. The study would motivate the regulators in promulgating better corporate governance regulations that would be more encompassing and contribute effectively to enhancing firm values and resolving agency conflict.

### Research Questions

From the above discussion, the following research questions became pertinent:

- i. What is the effect of board size on tax aggressiveness in listed Industrial Goods?
- ii. How effect does independent directors have on tax aggressive in listed Industrial Goods?

The study evaluates the effect of board of director's structure on tax aggressiveness of listed industrial goods in Nigeria for the period of twelve (12) years between (2007-2018). However the specific objectives are to:

- i. evaluate the effect of board size on tax aggressiveness in listed Industrial Goods in Nigeria.
- ii. assess the effect of independent directors on tax aggressiveness in listed Industrial Goods in Nigeria.

## 2. LITERATURE REVIEW

The study lies on stakeholder's theory as tax aggressiveness become an act aimed at reducing tax liabilities in a planned manner. It is thus important to understand that the interests of stakeholders are not adequately protected as a firm becomes tax aggressive. Companies tend to violate the codes of best practices suggesting that they should be ethically and morally responsible to their stakeholders; thus they tend not to be socially responsible by minimizing their tax liabilities. For instance, tax aggressiveness affects the stake of the government directly and the public indirectly; as reduction in tax liabilities shrinks government revenue which were to be used in providing infrastructures for the country, which in turn brings about enhanced economic growth and development. (Jiraporn, Kim, & Davidson (2005)

The stakeholders' theory provides that the firm is a system of stakeholders operating within the larger system of the host society that provides the necessary legal and market infrastructure for the firms' activities (Khurana, & Moser, 2013). The purpose of the firm is to create wealth or value for its stakeholders by converting their stakes into goods and services.

Martinez *et al.*, (2015) investigated the effects of the Sarbanes-Oxley Act (SOX) on the tax aggressiveness of Brazilian firms listed on the BM & FBovespa between 2004 and 2012. The Partial regression analysis model was used to analyse the data collected. In practical terms, the result evidenced that the implementation of more stringent internal control does not inhibit aggressive tax practices of Brazilian firms. Thus, they concluded that despite the strong empirical evidence that better internal controls improve the quality of accounting results, these rules alone did not appear to have a significant effect in reducing the tax aggressiveness of the firms during the period studied.

Bujie (2015) evaluated the effect of board characteristics on tax aggressiveness of listed banks in Uganda. The data was analysed using the regression model and the study finds relationships between corporate governance factors such as

directors' average number of shares in the company, board independency, shareholder power, power of minority shareholders and the effective tax rate, but the relationship may be greatly affected by economic environment. The study concluded that corporate governance factors indeed affects the tax aggressiveness of the companies in Germany.

Khaoula (2013) examined the influence of corporate governance on tax planning of selected American companies from 1996 to 2009. Multiple regression analysis was used to analyse the data gathered and the findings of the study revealed directors constitute fundamental factors of corporate tax planning. However, the study found no significant relationship between board size and the corporate effective tax rates. The findings of the study support the positive effect of the incentive compensation plans on the CEO performance; and thus, concludes that the adopted compensations policy motivates the COEs to decrease the corporate fiscal charges.

Jalali and Jalali (2013) determined the impact of board of directors' Structure on Tax Avoidance in companies Listed in Tehran Stock Exchange for the period 2010 to 2012. The logistic regression method was used in order to evaluate the data used. the study revealed that the independence of the board had a significant relation with the aggressive tax policies. However, the ratio of non-executive members of the board did not show a positive and significant relation with tax avoidance policies. Moreover, board change cannot formulate the tax avoidance policies. The study concluded that a board of increased number of non-executive members apply less aggressive tax policies and also that board changes is not-executive directors that are competent with adequate knowledge on board matters; this will enhance the integrity and independence of the board.

Stavroula (2015) studied the association between corporate governance practices and the extent of tax evasion for the Greek listed companies in Athens from 2000 to 2004; when they operated in an accounting environment characterized by a high level of book-tax conformity. A univariate analysis was used to estimate the data collected. The findings of the study observed that tax evasion is lower when the chairman of the board is also the owner of the company. A strong negative association was reported between tax evasion and the percentage of shares held by the owner and its family members and also percentage of stock held by board members. The remuneration of board members through the distribution of profits was found to significantly decrease the evasion of taxes whereas tax evasion is higher when board members are also employees of the company. The study concluded

that the need for the implementation of international codes on corporate governance practices is imperative; as that call for greater independence of the board.

Zemzem, and Ftouhi (2013) investigated the effects of board of directors' characteristics on tax aggressiveness, using a sample of 73 French companies on the SBF 120 index for the period of 2006 to 2010. A regression analysis was used to estimate the data collected. The findings of the study showed that the board size and the percentage of women in the board affect the activity of tax aggressiveness; while Return on assets and size of the firm were significantly and positively associated. It was also revealed that the higher proportion of outside members and duality don't reduce the likelihood of tax aggressiveness. The study created a unique insight into board diversity and its impact on tax aggressiveness.

Based on the reviewed literature the following hypotheses were developed.

**HO<sup>1</sup>:** there is no significant effect between board size and tax aggressiveness on listed industrial goods companies in Nigeria.

**HO<sup>2</sup>:** there is no significant effect between independent directors and tax aggressiveness on listed industrial goods companies in Nigeria.

**3. METHODOLOGY**

Since the data is panel in nature the study adopts ex-post factor research design. Out of twenty two (22) listed Industrial goods in Nigeria, fifteen companies were selected using simple convenient technique for the period of five years from 2016-2020 indicating that seven (7) industrial goods companies does not have complete annual report and account for the period under investigation as a result of poor capital constraint and insecurity leading to their liquidation and opt them out as quoted companies in Nigeria. The data was estimated and analysed by employing multiple regression using STATA 16 statistical software.

**Model Specification**

The model connecting Tax aggressiveness with board structure is given as:

$$TA = f(\text{Board characteristics}) \dots\dots\dots(1)$$

$$TA = f(\text{BSZ, IND, ROE, FSZ, and LEV}) \dots\dots\dots (2)$$

equation (2) can also be Specified as:

$$TRT_{it} = \alpha_1 + \beta_2BSZ_{it} + \beta_3IND_{it} + \beta_4ROE_{it} + \beta_5FSZ_{it} + \beta_6LEV_{it} + \varphi_i \dots\dots(3)$$



Where:

TA = Tax aggressiveness is measured by Tax Rate (TRT)

BSZ = Board size

IND = independent directors

ROE= Return on Equity

LEV=Leverage

FSZ= Size (Natural Log of Total Assets)

$\alpha$ =Constant Term

$i$  =No of Firms

$t$ = Time Period

$\varphi_i$  = Error term

#### 4. RESULT AND DISCUSSION

This section present the analysis of result and discussion of findings, descriptive analysis of variables under investigation, correlation, fixed and random effect test as well as Hausman tests were conducted below.

**Table 1: Descriptive statistics**

Statistics	TRT	BSZ	IND	LEV	ROE	SZE
Mean	0.75	5.42	1.00	1.54	0.01	6.20
Median	0.22	4.28	1.00	0.18	0.02	4.00
Maximum	101.23	11.66	5.00	437.8	1.05	8.00
Minimum	-13.50	4.92	0.00	-1.01	-0.38	2.00
Std. Dev.	12.01	1.11	1.00	15.43	0.11	1.22
Observation	180	180.00	62.00	62.00	179.00	179.00

Source: Authors Computation, (2020).

In order to examine the characteristics of the series, the descriptive statistics of the variables used in this study for the 15 Industrial Companies over the period twelve (12) years 2007 to 2018 are presented in Table 1. The mean values of tax rate (TRT), board size (BSZ), independent directors (IND), leverage (LEV), return on equity (ROE) and firm size (SZE) 0.75, 5.42, 1.00, 1.54, 0.01, and 6.20, while the median values are 0.22, 4.28, 1.00, 0.18, 0.02, and 4.00 respectively.

The descriptive statistics also shows that there are large margins between the minimum and maximum values of the series. This is an indication of enormous fluctuations of the variables over the period considered. In other words, there are significant changes in all the variables over the period as indicated by their standard deviation (TRT)12.01, (BSZ)1.11, (IND)1.00, (LEV)15.43, (ROE)0.11, and (SZE)1.22, respectively. This shows that the variables are not constant over time. Hence, the study examines their relationship and impact on the dependent variable (TRT). Meanwhile, dividing the standard deviation of each variable by its mean

value (coefficient of variability), gives the extent of changeability of the variable. In this case, TRT (dependent variable) has highest coefficient of variability. This means, TRT varies over the period (2007 to 2018) more than any other variable considered in this study. Therefore the choice of panel regression becomes necessary for the estimation of the model.

**Table 2: Correlation Matrix**

VARIABLE	BSZ	TRT	SZE	IND	LEV	ROE
BSZ	1.000					
TRT	0.163	1.000				
SZE	0.144	-0.0225	1.000			
IND	0.583	0.0086	0.312	1.000		
LEV	0.102	-0.0016	0.0808	0.0346	1.000	
ROE	-0.109	0.059	-0.075	-0.155	-0.0123	1.000

Source: Authors Computation, (2020).

In data analysis, test of Multicollinearity via correlation is imperative. Multicollinearity implies interdependence among independent variables in a regression model. It is an economic problem that nullifies the result of least square regression and leads to wrong statistical implications as well as misleading policy decisions in research. To examine the existence or otherwise of interdependence among the variables used in this study, a pair-wise correlation test was conducted. This shows the nature of relationship between each pair of the variables used. The result of the correlation as presented in the table above, shows that SZE and LEV are negatively related to TRT while all other variables are positively related to it. Equally, there are mixtures of positive and negative relationship among the variables. Yet, the coefficient of correlations is less than 0.5 for all the variables. Therefore, the correlation among the variables is very weak which indicate the absence of multicollinearity among the variables

**Table 3: Fixed and Random Effect Regression Result**

VARIABLES	Fixed effect	Random effect
Board Size (BSZ)	-0.01132 (0.2114)	0.0149 (0.2170)
Independent directors (IND)	1.3212*** (1.0549)	1.0289*** (0.1683)
Firm size (FSZ)	-0.1224 (0.2631)	-0.0754 (0.2358)
Return on Equity (ROE)	0.1316 (1.1235)	0.5711 (1.0276)
Leverage (LEV)	2.117e-06 (0.0131)	3.9791e-02 (0.0017)
Constant	8.909*** (1.9596)	15.037*** (2.6134)
R-squared	0.112	15

Source: Authors computation (2020).

Standard errors in parentheses \*\*\*, \*\* and \* denote 1%, 5% and 10% level of significance respectively

The result of the fixed effect regressions for the investigation of the effect of board characteristics on corporate tax aggressiveness is represented in by TRT while the independent variables are Board size (BSZ), Independent directors (IND), Firm size (FSZ), Return on Asset (ROE) and Leverage (LEV).

The result in table 3 indicates that BSZ and FSZ are negatively related to tax rate (TRT), -0.01132 and -0.1224, as seen in the coefficient of the variables 0.2114 and 0.2631 respectively. While (IND), (ROE) and (LEV) are positively related to TRT 1.3212, .1316 and 2.11 respectively as also revealed by the coefficient of the variables 1.0549, 1.1235, and 0.01331 respectively. However, an independent director (IND) is the variable that is statistically significant. This implies that the variable independent directors (IND) have significant impact on corporate tax aggressiveness measured by TRT of Listed industrial goods companies in Nigeria.

The extent of the impact of the variables is measured by the values of the coefficients of the variables in (table 3). By size, the estimates of the coefficients show that an increase in independent directors (IND) will respectively lead to 0.2114 and 0.2631 increases in the (TRT). By implication, listed industrial goods companies in Nigeria with higher number of independent directors (IND) would have higher tax rate (TRT). This indicates that independent directors (IND) have great impact on tax aggressiveness of listed industrial goods companies in Nigeria.

Meanwhile, the random effect result shows that FSZ is negatively related to (TRT) at -0.0754 with a coefficient of 0.2358 while Board size (BSZ), Independent directors (IND), return on equity (ROE) and leverage (LEV) (0.0149, 1.0289, 0.5711 and 3.9791) with coefficients of (0.2170, 0.1683, 0.0276 and 0.0017) are positively related to TRT. This is similar to that of the fixed effect regression except for the FSZ that has negative relationship with TRT in the fixed effect model earlier reported. Meanwhile, the random effect model shows that Independent directors are statistically significant.

As seen in the table above, the significance is indicated by asterisks. The statistical significance implies that, IND is important determinants of TRT. Thus, the coefficient of the variable as stated above indicates that an increase in independent directors (IND 1.0289) will lead to increase in TRT of listed industrial goods companies. Therefore, the random effect regression shows that IND has significant impact on the TRT and subsequently affect the extent of tax aggressiveness listed industrial goods companies in the Nigeria.

**Table 4. Hausman Test**

Model	Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
One	Cross-section random	13.21	4	0.1535

**Authors computation, (2020).**

Hausman test was conducted to make a choice between Fixed and Random Effects Model estimates as shown on the table above the calculated p-value is lower than significance level of 5%, we are not inclined to accept the null hypothesis that the differences between the estimated parameters yielded by the two estimation techniques are not systematic. As a result, random effects method produces better results for the model and is therefore adopted for this study.

## RESULT INTERPRETATION

The existence of independent director on the board was examined and the study revealed a positive relationship between both variables, as the existence of independent director has a significant impact on tax aggressiveness of quoted financial service companies in Nigeria. This implies that the existence of a higher percentage of independent directors on the board increases the effective tax rate (tax aggressive activities are low). In other words, the presence of independent director impacts negatively on tax aggressiveness of Nigeria industrial goods companies; thus the null hypothesis is rejected. Therefore, finding this study in line with the work of (Mustapha and Nasir 2018), in Pakistan, but contradict the works of (Martinez et al, 2015) which showed that the existence of independent directors had no significant effect on the corporate tax planning of Brazil.

## 5. CONCLUSION AND RECOMMENDATIONS

Based on the findings, the study concludes that significant relationship exists between board characteristics and tax aggressiveness of listed industrial goods companies in Nigeria. Therefore, the study recommends that the listed industrial goods companies in Nigeria should give less attention to the size of their board, and focus on the quality and integrity of the members of the board; in respect to her members having broad cognate experience and expertise on board matters. More so, they should adhere strictly to the provisions of the SEC and CBN code of corporate governance which provides that a company should have one (1) and two (2) independent directors respectively. This is necessitated as the presence of independent directors to ensure independence of the board.

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## Is the Heterogeneity of Expenditure Relevant to Economic Growth? The Case of Nigeria



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### Abstract

**W**ith the Nigerian economy oscillating around financial quagmire and fast moving towards fiscal unsustainability, this study analysed the impact of disaggregated expenditures on economic growth. Employing data from 1980 to 2019, the study established through the autoregressive distributed lagged technique that heterogeneity in expenditure is relevant to economic growth, with recurrent expenditure contributing insignificantly to economic growth, while capital expenditure negatively impact economic growth. Thus, among other policy options, the study suggested appropriate expenditure switching policies that prioritise capital expenditure over recurrent expenditure and that government should engage more in the provision of capital projects in the economy.

**JEL Classification:** E24; E52

**Keywords:** Fiscal, Expenditure, Recurrent Expenditure, Capital Expenditure, Economic Growth, ARDL

### INTRODUCTION

**N**o economy operates in a vacuum devoid of fiscal responsibilities. Economic activities require financial obligations to be undertaken. This involves huge expenditure on activities such as security, health, agriculture, education, and other social and economic activities. The growth level of an economy largely depends on a well-articulated and coordinated expenditure framework taking into cognizance current economic realities.

Nigeria is not insulated from financial obligations and its burdens. Several years of maladministration and financial misappropriation has resulted in huge expenditure which are largely financed by domestic and external borrowings (Omotor, 2019; Ekpo and Udo, 2013). For instance, aggregate expenditure rose from N11.41 billion in 1981 to N701.05 billion in 2000. This figure stood at N9,286.39 billion in 2019. During this period, external and domestic debts rose from N2.33 billion and N11.19 billion respectively in 1981 to N3,097.38 billion and N898.25 billion respectively in 2000. External and domestic debts stood at N9,022.42 billion and N14,272.64 billion respectively in 2019 (CBN, 2019).

Several studies on the relationship between expenditure and economic growth in Nigeria have emphasised on the delimitating effects of huge Government expenditure on economic growth. As plausible as their findings sounds, other studies showed that such expenditures have impacted growth negatively (Udoh, et al., 2020; Nwaeze, et al., 2015; Obed, et al., 2017; Ewubara, et al., 2017; Ekpo and Udo, 2013; among others).

However, recent trend in the Nigerian Government spending accompanied by huge borrowing from local and international sources have raised fears that the country might be moving on a knife-edge towards insolvency. For example, orchestrated by the emerging COVID-19 pandemic, the Government launched the ₦500 billion (\$1.3 billion) COVID-19 Intervention Fund. The country also had the Central Bank of Nigeria (CBN) ₦50 billion credit facility and ₦100 billion credit intervention (Central Bank of Nigeria, 2020). To fund these laudable projects and programmes, the Government resorted to borrowing \$4.34 billion from the domestic stock market and \$3.4 billion from the International Monetary Fund (IMF, 2020; Dixit, et al., 2020). Currently, the Government is proposing to access \$1 billion and \$2.5 billion from the African Development Bank and the World Bank, respectively (Dixit, et al., 2020; Osae-Brown and Soto, 2020).

The above trend raises several questions: What is the impact of aggregate expenditure on economic

growth? Is the heterogeneity of expenditure relevant in the expenditure-economic growth relationship? These questions form the crux of the study. To answer those questions the study draw from the expenditure-growth studies. This paper contributes to the expenditure-economic growth discussions by focusing on the heterogeneity of the various components of aggregate expenditure as they impact economic growth.

The rest of the paper is organised as follows. Section 2 provides a brief overview of expenditure and economic growth trajectories in Nigeria. Section 3 deals with the literature review and Section 4 presents a review of the methodology employed in the study; Section 5 presents the empirical results; Section 6 presents policy recommendation; while Section 7 concludes the study.

## 2. Nigeria Expenditure-Growth Trajectory: Stylised Facts

In the last six decades, the Nigerian economy has experienced several social and economic upheavals, ranging from high unemployment rate, huge public debts, low capital investment, high poverty rate, to huge Government fiscal deficits, just to mention a few. Following Nigeria political independence in 1960, the Nigerian history has been an "oil-dependent" narrative. Between 1960 and 1974, Government fiscal deficits was not an economic issue even though the two coup d'états of 1966 and the civil war (1967-70) depressed economic growth between 1966 and 1967. The oil boom of 1973-1974 era as well as sharp oil price increase of 1979-1980 led to high Government expenditure with the aim of building the capacity of the oil industry. These programmes and projects led to huge financial burdens and did not significantly contributed to economic prosperity since the economy lacked the requisite capacity to handle such projects (Ajayi, 2003).

A slump in oil prices in the 1980s further damped economic growth, although this did not discouraged Government spending. Despite fiscal deficits due to revenues shortfall Government expenditures continued to grow. There has been an increasing trend in Government fiscal deficits since 1980. This figure rose from N3.90 billion in 1981 to N103.78 billion in 2000. At 2019 Government fiscal deficits stood at N4.913.82 billion (CBN, 2019). To finance these increasing fiscal deficits, the Government resorted to excess borrowing from domestic and external sources.

Traditionally, Government expenditure is decomposed into two: recurrent and capital expenditure. Each of is segmented into the following:

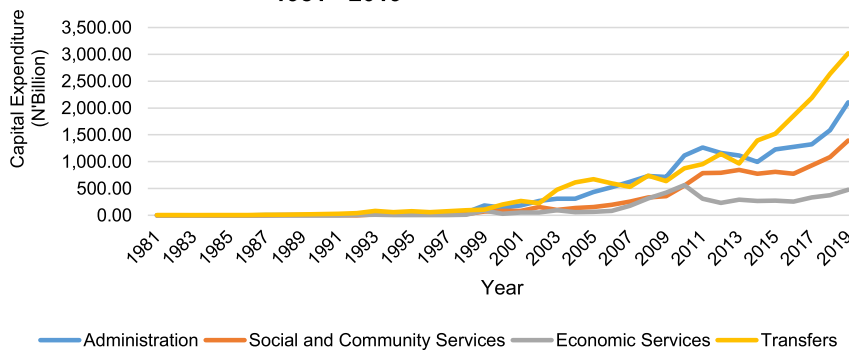
1. Administration (General Administration, Defence, Internal Security, National Assembly).
2. Social and Community Services (Education, Health, Other Social and Community Services)
3. Economic Services (Agriculture, Road & Construction, Transport & Communication, Other Economic Services)
4. Transfers (Public Debt Servicing (Domestic & Foreign), Pensions and Gratuities, /other CFR charges, Contingencies/Subventions).

It should be noted that Government intervention in the economy through fiscal policy is not only to correct for market failures, but also to ensure a level playing field for all stakeholders and avoid Government failures. The economy, if let alone to operate under the often – unrealistic competitive market assumptions would operate at sub-optimal level satisfying only a fraction of the population. Hence, Government spending in education, health, security, research, environmental issues, among others, lubricate the wheels of growth and development.

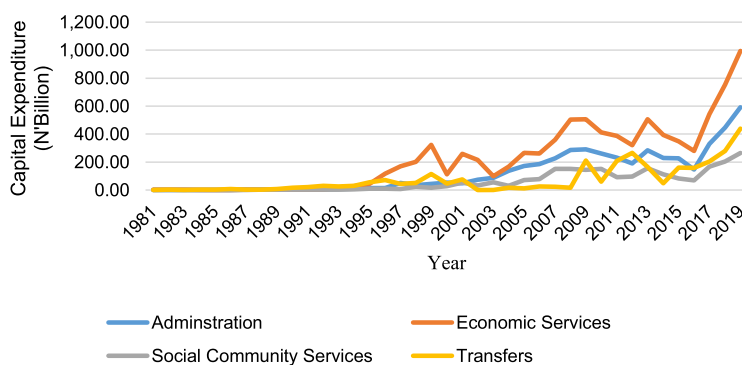
Government expenditures as a component of fiscal policy remain crucial for growth and development. Capital expenditures which involves investments such as roads, railways, power, hard infrastructure, and soft infrastructure like education and health are essential for growth. In the same vein, recurrent expenditures would enhance growth during periods of declining productivity and/or recession. However, the extent of the impact of expenditures on growth needs to be subjected to empirical test. The bulk of recurrent expenditure is for personnel cost. Government expenditures are also used in purchasing goods and services as well as interest payments.

Figures 1 and 2 show the trend in the sub-divisions of the recurrent and capital expenditure. Figure 1 shows that transfers and administration constituted the highest proportion of recurrent expenditure. By implication Nigeria recurrent expenditure predominantly covers defence internal security, national assembly, public debt servicing, pensions and gratuities, as well as contingencies/subvention. Negligible amount is allocated to economic, social and community services.

**Figure 1. Nigeria: Disaggregated Recurrent Expenditure, 1981 - 2019**



**Figure 2. Nigeria: Disaggregated Capital Expenditure, 1981 - 2019**

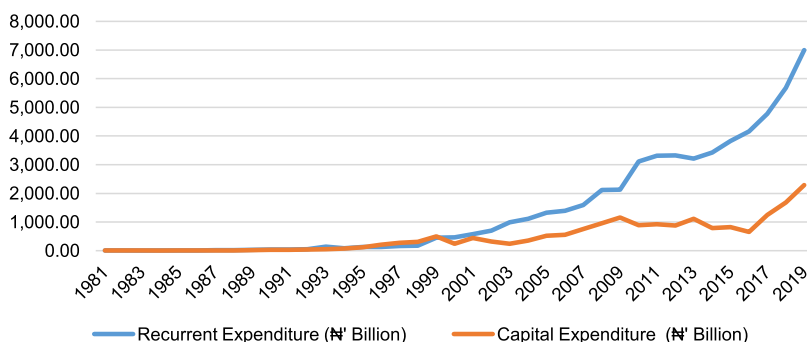


Source: CBN Statistical Bulletin (2019).

In the case of capital expenditure, more financial resources are allocated to economic services. A look at the disaggregated expenditure shows that during 1981-1997 period, recurrent and capital expenditure were relatively moving in tandem. However, from 2000, recurrent expenditure increased at a faster rate. For instance, while capital expenditure was N239.45 billion in 2000, recurrent expenditure stood at N461.60 billion. At 2019, recurrent expenditure stood at N6997.39 billion, while capital expenditure was just

N2,289.00 billion (see figure 3). In all the years, recurrent expenditure has taken prominence over capital expenditure as can be seen in Table 1. In the 1981-90 era, the ratio of capital expenditure in total expenditure was 43.34 per cent while that of recurrent expenditure was 56.66 per cent. In the 2011-2019 era, the recurrent expenditure-total expenditure ratio was 79.32 per cent, with that of capital expenditure slightly above 20.0 per cent.

**Figure 3. Nigeria: Disaggregated Expenditure, 1981-2019.**



Source: CBN Statistical Bulletin (2019).



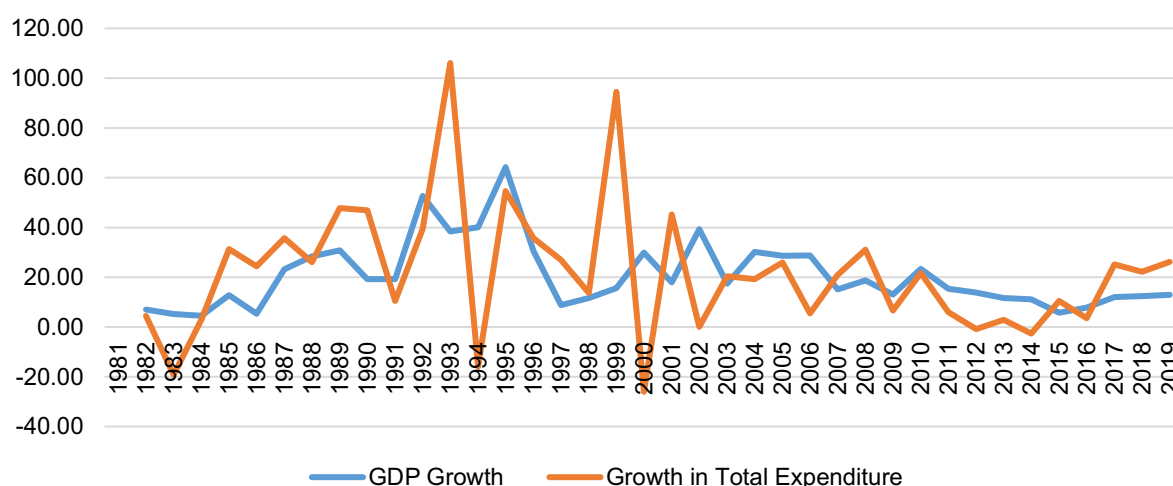
**Table 1. Nigeria: Recurrent and Capital Expenditures as Ratios of Total Expenditure (%), 2010-2019**

Year	Capital Expenditure/Total Expenditure (%)	Recurrent Expenditure/Total Expenditure (%)
1981-1990	43.34	56.66
1991-2000	48.29	51.71
2001-2010	29.59	70.41
2011-2019	20.68	79.32

Source: Authors' Compilation.

The growth of expenditure vis-à-vis that of GDP is also worth noting. Wide gyrations were observed in the growth of total expenditure when compared with that of GDP, indicative of fiscal deficits (see Figure 4). The implication of such movements in expenditure on economic growth is worth given empirical consideration.

**Figure 4. Nigeria: Growth in Expenditure and GDP, 1981-2019.**



Source: CBN Statistical Bulletin (2019).

Interestingly, capital expenditures which are essential for growth and development grew negatively between 2014 and 2017 with marginal increases in value in subsequent years. A cursory examination of Nigeria's budget shows that since 2010, in no year was capital expenditure above 30.0 percent of total expenditure yet this component is vital for growth (CBN, 2019). The expenditures profile stresses more on allocation rather than outcomes.

### 3. LITERATURE REVIEW

Empirical studies on the expenditure-economic growth nexus are far from being conclusive, since these studies have produced conflicting results. While some of the studies have produced positive relationship (Kimaro, et al., 2017; Attari and Javed, 2013; Yasin, 2000), others have asserted a negative relationship (Sáez, et al., 2017; Nurudeen and Usman, 2010). Still others are neutral in their conclusion (Shahid et al., 2013; Egbetunde and Fasanya, 2013;

Schaltegger and Torgler, 2006).

Gabor and Marton (2020) utilised the General Method of Moment (GMM), fixed effects panel and ordinary least squares (OLS) models on economic data of 25 EU countries in the period 1996 to 2017; Leshoro (2017) analysed data of 1976 to 2015 in South Africa using the ARDL technique; Guandong and Muturi (2016) employed the random effect panel analysis on South Sudan data covering 2006 to 2014; Al-Fawwaz (2016) used both the OLS and multiple regression models on expenditure and growth data of Jordan between 1980 and 2013; Shahid, et al., (2013) estimated Pakistani data between 1972 and 2009 using the ARDL model on disaggregated expenditure (development expenditure and current expenditure); while Yasin (2000) employed data of 26 Sub-Saharan African (SSA) countries between 1987 and 1997, utilising both the fixed and random effects estimation techniques. These studies established a positive impact of expenditure on economic growth. In addition, Barlas (2020) analysed Afghanistan data

of 2004 to 2019 using the ARDL model and found that expenditure on education and infrastructure positively impact economic growth.

On the other hand, other studies showed that expenditure exerts a negative impact on economic growth. For instance, Barlas (2020) analysed Afghanistan data of 2004 to 2019 using the ARDL model and found that expenditure on security negatively impact economic growth. Ghosh and Gregoriou (2008) examined the impact of expenditure on economic growth in 15 developing economies utilising the GMM and found that capital expenditure impact economic growth negatively. The study of Chirwa and Odhiambo (2016) was undertaken in South Africa utilising the ARDL technique with a dataset spanning between 1970 and 2013. The study showed that in both the short-run and long-run, expenditure impact economic growth negatively.

Employing a panel data of 19 sub-Saharan Africa (SSA) countries between 1982 and 2000, Ndambiri et al., (2012) utilised the GMM technique and found that expenditure negatively impact economic growth. In the same vein, the study of Sáez et al., (2017) also employed panel data of selected EU countries spanning 1994 to 2012 and found that Government spending impact on growth negatively among the EU countries. Lupu, et al. (2018) constrained the scope of their study to 10 selected Central and Eastern European countries. Using data of 1995 to 2015 and 10 disaggregated expenditure categories in an ARDL framework, the study found a negative impact.

A wide range of literature have examined the effect of expenditure on economic growth in Nigeria. Some studies in Nigeria analysed the impact of disaggregated expenditure on economic growth. For instance, Onifade, et al., (2020) examined the impacts of capital expenditure and recurrent expenditure on economic growth. Employing the ARDL technique on economic data between 1981 and 2017, the study had mixed findings. Specifically, recurrent expenditure impacted economic growth negatively, whereas capital expenditure impacted economic growth positively, although the impact was not significant. Bonmwa and Ogboru (2017) utilised two models on recurrent and capital expenditure on economic data ranging from 1981 to 2016. The study found that Government expenditure did not significantly impacted economic growth. Specifically, while expenditure on administration and social services negatively impact economic growth, expenditure on economic services positively impact economic growth although their impacts were insignificant. Ogar, et al., (2019) investigated the impact of Government expenditure on economic growth. Expenditure was disaggregated into capital

and recurrent expenditures, while the study covered the 1980-2017 period using the VAR technique. Empirical findings showed that capital expenditure has an insignificant positive impact on economic growth. It also established that recurrent expenditure has an insignificant positive effect on economic growth in the short-run, whereas it exerts a negative and insignificant effect on economic growth in the long-run.

In the same vein, utilising disaggregated data between 1999 and 2016, Chineze (2018) found that health expenditure exerted a positive and significant impact on economic growth, while the other disaggregated expenditures did not. These findings showed that expenditure has differential effects on economic growth. This corroborated the conclusion of Ebong, et al., (2016) who approached the expenditure-growth hypothesis using sectoral expenditure in Nigeria. Using capital expenditure in the education, agriculture, health and infrastructure between 1970 and 2012 in a multiple regression model, the study found that whereas capital expenditure in the agricultural sector did not impact on economic growth in both the long-and short-run, capital expenditure in the education exerted a positive impact on economic growth. Both the long-and short-run effect of the capital expenditure on health was negative and insignificant. A previous study by Nurudeen and Usman (2010) using data between 1979 and 2007 established that sectorally, Government expenditure on transport and communication and health positively and significantly impacted economic growth.

In the case of Okoye, et al., (2019), their study had mixed findings. Using data from 1981 to 2017, the study found that while capital expenditure exerted positive effects on economic growth, recurrent expenditure negatively impacted economic growth. Whereas, Danladi, et al., (2015) in analysing the expenditure-growth model employed the ARDL technique on economic data ranging between 1980 and 2013 and found a positive impact exerted by expenditure on economic growth. This corroborated the study of Egbetunde and Fasanya (2013) which also employed the ARDL technique on data from 1970 to 2010.

A consideration of the reviewed studies in Nigeria showed that other than a few studies such as Bonmwa and Ogboru (2017) which utilised two models in analysing the impact of expenditure on economic growth, there is dearth in local studies on the heterogeneity of expenditure as it relates to economic growth. There is need to carry out a comparative analysis of the impact of aggregated and disaggregated expenditure on economic growth.

#### 4. METHODOLOGY

This section presents the theoretical framework of the study, empirical models and data employed in the study.

##### 4.1. Theoretical Framework

The study hinges on the Keynesian framework given below:

$$Y_t = C_t + I_t + G_0 + [X_t - M_t] \quad (1)$$

Where;

Y is output or national income; C refers to consumption by households; I refers to private investment; G is the exogenously determined Government expenditure; X denotes exports; M refers imports; (X-M) refers to net exports; while t refers to the time period.

The Keynesian theory assumes households' consumption to be a function of income and this can be expressed as:

$$C_t = c_0 + c_y Y \quad (2)$$

Where

$c_0$  = autonomous consumption (i.e. consumption not dependent on income level)

$c_y Y$  = the consumption level dependent on households' income.

When tax is incorporated into equation (2), we have;

$$C_t = c_0 + c_y(Y - T) \quad (3)$$

Given a domestic interest rate as r, private investment function can be written as:

$$I_t = i_0 + \lambda r \quad (4)$$

Trade is decomposed into exports and imports. Exports are assumed to be a function of world income ( $\bar{Y}$ ) and real exchange rate (e) (see equation 5); while imports are assumed to be a function of exchange rate (e) and disposable income (Y), as seen in equation 6.

$$X_t = x_0 + \theta \bar{Y} + \eta e \quad (5)$$

$$M_t = m_0 + \Omega Y + \tau e \quad (6)$$

In order to attain equilibrium in national income, substitute equations (3)-(6) in the national income expression (Equation 1). We obtain the following:

$$Y^* = \alpha_0 + \theta \bar{Y} + \tau e + \lambda r + G_0 - \beta T \quad (7)$$

Note that  $\alpha_0$  refers to the autonomous expenditure components in the given economy. The exogenous Government expenditure is disaggregated into recurrent and capital expenditure, each of which has functional components. Equation (7) thus implies that ceteris paribus, economic growth depends on Government expenditure, among other factors.

##### 4.2. Estimation Techniques and Data

The expenditure-economic growth relationship is analysed using the autoregressive distributed lag (ARDL) technique (see Pesaran, et al., 2001; Pesaran & Shin, 1999). The method holds several advantages over other conventional cointegration techniques. The results of the ARDL gives more robust estimates and the technique can be applied to small sample sizes. This is essentially an advantage over the Engle-Granger (1987) and Johansen and Juselius (1990) methods which are highly unreliable for small samples (Pesaran, et al., 2001). The estimates of the ARDL are asymptotically normal and consistent since the efficiency of the technique do not depend on the level of integration of the data. Thus, the ARDL technique basically has no pre-testing issues. In order to ascertain the need to adopt this technique, there would be need to first test for unit roots among the dataset using the Augmented Dickey Fuller (ADF) unit root test. This is to ensure stationarity among the variables, ensure that no variable is of higher degree of integration more than one and avoid spurious results. The study employs data spanning 1981-2019.

##### 4.3. Empirical Model Specification

###### 4.3.1. Expenditure-Economic Growth Model

In equation (8), we specified the aggregate expenditure in the economic growth model. However, to capture the impact of Government expenditure in a disaggregated form (recurrent and capital) on economic growth, we specify the following long-run equation:

$$\begin{aligned} GDPG = & \gamma_0 + \gamma_1 GDPG_{t-i} + \gamma_2 RE_{t-i} + \gamma_3 CE_{t-i} + \gamma_4 INF_{t-i} \\ & + \gamma_5 OPN_{t-i} + \gamma_6 PI_{t-i} + \sum_{k=1}^w \lambda_k \Delta GDPG_{t-n} \\ & + \sum_{m=1}^q \lambda_m \Delta RE_{t-m} + \sum_{n=1}^q \lambda_n \Delta CE_{t-n} \\ & + \sum_{p=1}^q \lambda_p \Delta OPN_{t-p} + \sum_{r=1}^q \lambda_r \Delta PI_{t-r} + \varepsilon_t \quad (8) \end{aligned}$$

While the short-run model is expressed as:

$$\begin{aligned} GDPG = & \sum_{k=1}^w \lambda_k \Delta GDPG_{t-n} + \sum_{m=1}^q \lambda_m \Delta RE_{t-m} \\ & + \sum_{n=1}^q \lambda_n \Delta CE_{t-n} + \sum_{p=1}^q \lambda_p \Delta OPN_{t-p} \\ & + \sum_{r=1}^q \lambda_r \Delta PI_{t-r} + \pi ECT_{t-1} + \varepsilon_t \quad (9) \end{aligned}$$

###### 4.3.2. Variables Operationalisation

The table below operationalised the variables in equations (8) and (9). All variables are expressed in their logarithm forms.

**Table 2: Model Variables**

Variable	Description	Source
GDPG	GDP growth (a proxy for economic growth)	World Bank Indicators (WDI)
CE	Capital expenditure	CBN Statistical Bulletin
RE	Recurrent expenditure	CBN Statistical Bulletin
OPN	trade openness (total of exports and imports divided by GDP)	CBN Statistical Bulletin
PI	Private investment	CBN Statistical Bulletin
$\gamma_0 - \gamma_6$	Long-run multipliers	
$\lambda_k - \lambda_r$	Short-run multipliers	
$ECT_{t-1}$	Captures the speed to recovery to equilibrium in the economic growth model.	

Source: Authors' Compilation

## 5. Empirical Results and Discussion

### Preliminary Results: Unit Root Analysis

The unit root test was carried out to check the nature of the dataset and avoid the issue of spurious

regression results. The study adopted the Augmented Dickey Fuller unit root test and the results are presented in Table 3. The choice of the ARDL technique is validated given the varying level of integration of the variables [I(0) and I(1)].

**Table 3: Unit Root Test**

Variable	@ Level	@ 1 <sup>st</sup> Differences	Status
GDPG	-3.27*	-7.13***	I(0)
INF	-0.19	-3.19**	I(1)
OPN	-1.99	-4.21**	I(1)
PI	-0.87	-6.11***	I(1)
RE	-3.23**	-8.58***	I(0)
CE	-0.89	-3.71**	I(1)

Note:  $\rho$  values of coefficients: \*\*\*  $\rho < 0.01$ ; \*\*  $\rho < 0.05$ ;  $\rho < 0.1$

Source: Authors' Compilation

### 5.1. Empirical Results Bound Test

The level of cointegration of the data necessitated the bound test which measures the joint significance of the variables (Pesaran, et al., 2001). The results of the bound test under the restricted deterministic trend

( $F_\lambda$ ), unrestricted deterministic trend ( $F_\theta$ ), and without deterministic trend ( $F_\pi$ ) is presented in Table 4. A comparison of the computed F-statistic and the critical F-statistics shows a cointegration or a long-run relationship among the variables at the 1.0 percent level of significance.

**Table 4: Bound F Test**

	With Deterministic Trend			With Deterministic Trend		
	$F_\lambda$	$F_\theta$	$t_\theta$	$F_\pi$	$t_\pi$	
	10.42	17.31	-5.95	8.76	-5.67	
Lag = 1	10.0 percent			5.0 percent		
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
$F_\pi$	2.61	3.11	3.27	4.38	4.19	5.92
$F_\lambda$	2.95	3.57	3.52	4.61	4.63	6.81
$F_\theta$	4.03	5.29	4.22	6.01	5.62	6.99
$t_\pi$	-1.74	-2.81	-1.91	-3.13	-2.07	-4.07
$t_\theta$	-2.37	-3.72	-2.69	-4.82	-3.11	-5.09

Source: Authors' Compilation



### • Long-run Results

The long-run results are presented in Table 5:

**Table 5: Expenditure-Growth Nexus: Long-run Results**

Regressor	Coefficient	t-statistic
GDPG(-1)	2.173	0.915
RE	0.761	1.547
CE	-0.104**	-2.963
OPN	-1.216***	-1.902
PI	-0.016***	-3.695
Cons.	11.022***	5.142

Source: Authors' Compilation

The results revealed a positive but insignificant impact of recurrent expenditure on economic growth. Specifically, a 10.0 per cent increase in Government recurrent expenditure increases economic growth by over 7.6 per cent although the increase is statistically insignificant. Capital expenditure significantly impact on economic growth negatively. For instance, a 10.0 per cent increase in government capital expenditure decreases economic growth by over 10.0 per cent. This implies that capital expenditure in Nigeria has not positively impact economic growth. This is possibly caused by the bureaucratic processes which allow for excesses in the implementation of capital projects. The findings of this study on the impact of recurrent and capital expenditure on economic growth in Nigeria is in consonance with the findings of Okoye, et al., (2019), but at variance with those of Onifade, et al., (2020) and Ogar, et al., (2019).

The control variables (trade openness and private investment) did not evidently impact economic growth positively during the period under consideration.

### • Short-run Results

The short-run results are presented in Table 6:

**Table 6: Expenditure-Growth Nexus: Short-run Results**

Regressor	Coefficient	t-statistic
$\Delta$ GDPG(-1)	6.331***	4.914
$\Delta$ RE	0.977	1.209
$\Delta$ RE(-1)	-1.031**	-2.525
$\Delta$ RE(-2)	-0.628	-1.442
$\Delta$ CE	-2.373***	-3.919
$\Delta$ CE(-1)	-0.867	-0.827
$\Delta$ OPN	-1.411**	-2.619
$\Delta$ OPN(-1)	0.112*	1.926
$\Delta$ PI	-0.518***	-5.852
$\Delta$ PI(-1)	-0.884*	-1.874
$\Delta$ PI(-2)	-1.031	-0.713
ECM(-1)	-0.213***	-4.947
Constant	9.107***	3.881
R-Squared	0.663	
Adj-R-Squared	0.587	
F-Statistic	21.95 (0.0000)	
DW-Statistics	2.071	

Source: Authors' Compilation

The short-run regression results presented in Table 6 showed that recurrent expenditure positively impacted economic growth in the current year, although the impact is statistically insignificant. The impact was negative in the lagged two period, with the second period being statistically insignificant. This result could be alluded to the implementation process of recurrent expenditure in Nigeria. The result could be an indication of misappropriation of public funds allocated to recurrent expenditure. The ripple effect of such misappropriation is a negative impact on economic growth. In addition, since recurrent expenditures are usually financed by loans and a sizable amount of recurrent expenditure is budgeted for payment of debt servicing, such expenditures will adversely impact economic growth in the long-run. The result also confirms the endogenous growth model by Barro (1990) that opined that recurrent expenditure constitutes the consumption component of aggregate expenditure. While the result negated the findings of Idris and Bakar (2017), it conformed to those of Gukat and Ogboru (2017).

Capital expenditure impact economic growth negatively in both the current and one lagged period, although only the current period coefficient is statistically significant. Although capital expenditure can be considered as a macroeconomic stabiliser and can be used effectively as countercyclical fiscal policy tool, the result showed that capital expenditure has not significantly stimulated economic growth. The high level of corruption and execution of white

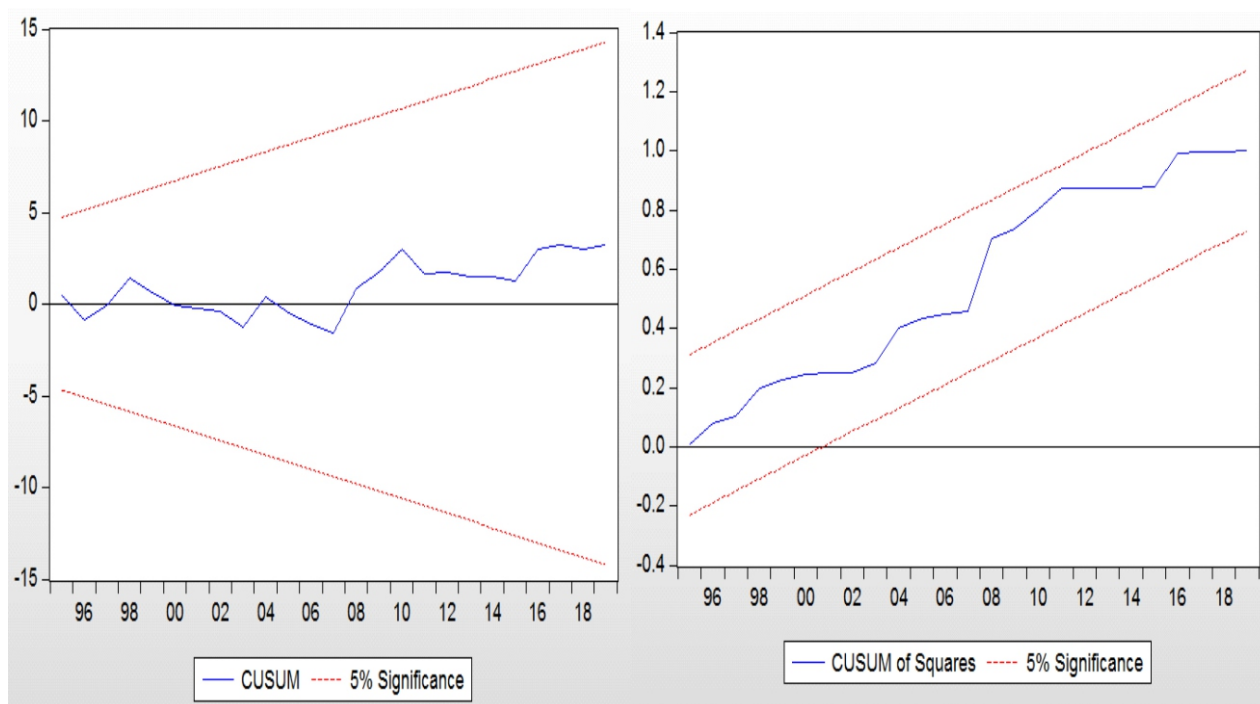
elephant projects which have little or no effect on growth, are possible reasons for such negative effect. Trade openness was statistically significant in the current year and impacts economic growth negatively. The lag coefficient of trade openness is statistically insignificant and impacts economic growth positively. The coefficients of private investments in all time period were negative.

The one-period lagged ECM coefficient is negative and statistically significant at 1.0 per cent level of significance. The ECM (-1) coefficient of -0.213 implies economic growth adjusts to equilibrium at a rate of 21.3 per cent per annum. This is slow in terms of restoring back to equilibrium in the case of a distortion in economic growth. The value of the R-squared showed that the variables in the model explain over 66.0 per cent variation in economic growth in Nigeria. The significant F-statistic clearly showed that the model is correctly specified. The Durbin Watson statistic shows that the model is void of autocorrelation and can be used for inferences.

**5.2. Post-Estimation Tests**  
**Test of Stability**

The CUSUM and CUSUM squared tests result in figure 5 showed that the residual plot falls within the 5.0 per cent significant boundaries and thus, indicates stability of the estimated parameters.

**Figure 5: CUSUM and CUSUM of Squares Test of Stability**



Source: EViews 10 Output

## Diagnostic Tests

The results of the various diagnostic tests showed that the model can be relied on for policy formulation

(table 7). These tests include: heteroskedasticity (using Breusch-Pagan-Godfrey), normality (using Jarque-Bera) and the serial correlation (using Breusch-Godfrey Serial Correlation LM Test).

**Table 7: ARDL Diagnostic Tests**

<b>Breusch-Godfrey Serial Correlation LM Test</b>			
F-Statistic	2.7319	Prob.	0.1031
Obs*R-Squared	3.8825	Prob. Chi-Squared	0.0593
<b>Jarque-Bera</b>			
F-Statistic	4.6127	Prob.	0.0511
<b>Heteroscedasticity Test: Breusch-Pagan-Godfrey</b>			
F-Statistic	1.2430	Prob.	0.3162
Obs*R-Squared	11.6827	Prob. Chi-Squared	0.2098
Scaled explained SS	8.1402	Prob. Chi-Squared	0.6614

Source: Authors' Compilation.

The results of the above listed tests as presented in table 7 showed that the residuals of the specified model were normally distributed; does not suffer from heteroskedasticity or serial correlation.

## 6. Recommendations

Given the relevance of the heterogeneity in expenditure, there is urgent need to re-evaluate the allocation process to ensure that financial resources are allocated to productive sectors of the economy. The government should ensure that the share of recurrent expenditure in total expenditures is kept within a reasonable proportion by blocking all leakages and wastages in public financing in the country.

One of the possible reasons for the insignificant impact of recurrent expenditure on economic growth is the high corruption level in addition to misappropriation of public funds. This re-emphasised the need for appropriate governmental authorities to rekindle the fight against corruption and financial misappropriation in the public sector. This will adequately check diversion of public funds to private use.

There is also need to expand the share of capital expenditure in order for the country to engage in more productive projects that will stimulate economic growth. Policies should be geared at creating a viable investment environment in Nigeria to attract local and foreign investments that will stimulate economic growth. The need to also enhance Nigeria's trading policies cannot be overemphasized. Such policies should be pursued to ensure more trade openness that will benefit the economy in the long-run with the right economic indicators in place.

Nigeria should pursue trade policies which will place the economy in an advantageous position. Through concerted efforts to diversify the economy, the trade openness of the economy will be further enhanced and this will stimulate economic growth.

## 7. Conclusion

With increasing Government expenditure in Nigeria through the period of analysis, this study analysed the impact of disaggregated expenditure in economic growth. The autoregressive distributed lagged model was employed to appraise this impact. Empirical findings showed that the impact of recurrent expenditure has not significantly impacted economic growth, while that of capital expenditure has negatively impacted economic growth. Although the results of the study were counter intuitive, they are justified given the economic scenario of Nigeria. An economy such as that of Nigeria which is bedeviled by high level of corruption and misappropriation of public funds will expected to have a slow growth trajectory. In addition, prioritising recurrent expenditure in the allocation is largely counter-productive since a huge proportion of recurrent expenditure is financed by loans which are now employed to service huge debt stocks. This has adverse effect on economic growth in the long-run. Thus, the results of this study indicate the importance of taking into account the heterogeneity of expenditure when analysing the expenditure economic growth nexus.

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## Activity Series of the Central Bank of Nigeria's Development Finance Interventions



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### Abstract

**T**he Central Bank of Nigeria (CBN) aggressively pursues credit and interest rate policies to promote inclusive economic growth. Through this, it aims to expand availability, access, and affordability of financial capital for micro, small and medium enterprises (MSMEs). With at least 24 MSMEs financing programmes of its own, the Bank manages one of the largest suites of developmental programmes among central banks. This paper attempted to serialize and characterize these programmes, hence determine their activity status and discover patterns of implementation effort, patronage, and responsiveness of target enterprises to available incentives. Applying Z-score and min-max methods of normalization and geometric and arithmetic aggregation techniques, the study develops a composite indicator and establishes a broad ranking of programmes, based on cumulative loan disbursements, outreach (loan volumes) and principal repayments. Results showed that

programmes specifically focused on agriculture and those introduced to rev the economy following the COVID-19 pandemic, dominated the activity series. Programmes specifically targeting youths and multi-sectors were among those with the least activity. It is recommended that the Bank identifies why some interventions are not optimal, work to reverse the trend and achieve stated objectives.

**Keywords:** Central Bank of Nigeria, CBN, composite indicator, development finance.

**JEL:** Classification: C43, E51, E58.

### 1.0 INTRODUCTION

**I**n pursuit of its developmental mandate of stimulating financial and economic development, the Central Bank of Nigeria (CBN) is aggressively pursuing credit and interest rate policies to promote inclusive economic growth. This course of action aims to expand the availability, access, and affordability of credit for micro, small and medium enterprises (MSMEs) that are generally acknowledged to be engines of growth (Keskin et al, 2010; African Development Bank, AfDB, 2011; Oduntan, 2014; Opafunso and Adepoju, 2014; Obi et al, 2018; PricewaterhouseCoopers (PWC), 2020; Erdin and Ozkaya, 2020).

With at least twenty-four MSMEs financing programmes (CBN, 2020), it is unarguable that the CBN operates one of the largest collections of development finance interventions or programmes among central banks. However, it is one thing to introduce a programme and another to ensure adequate activity levels under it, activity levels that are commensurate with expected outcomes. For the scope of our work, a pertinent question is how to determine the activity levels.

Experientially, the activity level in any CBN development finance intervention is primarily traceable by the amount disbursed, outreach or volume of projects/ enterprises financed, and amount repaid. These three indicators constitute the standard summary performance report for the interventions (CBN, 2020) and, in general, are considered immediate and convenient proxies for remote quantitative impact measures. When taken cumulatively, they serve as approximate measures of effort exerted in managing an intervention, the level of programme uptake by intended users, and their responsiveness to available policy incentives often championed in the programme guidelines and implementation framework.

Like the activity (or reactivity) series of metals, this paper attempts to characterize and serialize CBN's development finance interventions to determine their activity levels. By broadly distinguishing between the interventions along activity levels, it is possible to have specific insights for evidence-based policy formulation and reviews. It is equally possible, albeit to a lesser extent, given periodic or snapshot updates to the proposed framework, to assess "displacement" or "substitution" effects among the array of inter-related interventions. Both perspectives are required to maximize or, at least, optimize desirable intervention efforts and outcomes.

Applying Z-score and min-max methods of normalization and geometric and arithmetic index techniques to cross-sectional data on the interventions, the paper develops a composite indicator to establish a broad ranking of the programmes using three indicators: cumulative loan disbursements, outreach (loan volumes), and principal repayments. The composite indicator is made invariant to the number of years the programme has been in operation and the average size of enterprises financed in the programme by adjusting for both factors.

Following this introduction, the paper reviews theoretical and empirical considerations in Section Two, presents the methodology in Section Three, and discusses the results and findings in Section four. It concludes with recommendations in Section five.

## 2.0 Theoretical and Empirical Considerations

The Organization for Economic Cooperation and Development (OECD) posits that a composite indicator is a combination of individual indicators into a single index, having regard for an underlying model of the multi-dimensional concept being measured. It should, ideally, rely on a theoretical framework which allows individual indicators or variables to be systematically selected, combined and weighted to reflect the dimensions or structure of the phenomena being measured (OECD, 2004).

Individual indicators, also known as component indicators, components, or sub-indicators, must be combined contingent on certain theoretical considerations and statistical representations that culminate in one, unified indicator. These statistical representations maybe simple or complex, depending on the issue of interest, but the composite index is usually constructed as an average of indicators or sub-indices, an aggregate measure of a combination of factors.

The multidimensionality of development is the motivation behind major composite indicators that assess countries on performance in specified

parameters. Such indicators include the United Nations Human Development Index (3 dimensions), Global Entrepreneurship Index (14 pillars); Global Competitiveness Index (12 pillars); Gender Inequality Index (3 dimensions); Ease of Doing Business Index (10 pillars, 41 sub-indicators); Global Findex (6 dimensions); and the Nigeria Multidimensional Poverty Index (4 dimensions, 11 indicators).

The OECD-Joint Research Council handbook on the construction of composite indicators (OECD-JRC, 2008) opined that composite indicators could be misleading if poorly constructed or wrongly interpreted, as their "big picture" outcomes may prompt simplistic diagnostic or policy conclusions. Rather, such indicators should serve to initiate discussions and arouse public attention and their significance should be assessed with respect to subjects affected by the composite index.

According to Saisana (2004), composite indicators should be identified as "simplistic presentations and comparisons of performance in given areas to be used as starting points for further analysis and discussion". To the extent that this is so, it is believed that they are useful for summarization of relative performance and ordinal rankings which may not necessarily imply an assessment of depth. Greco et al (2019) reviewed methodological issues of composite indices, particularly, weighting, aggregation, and robustness. They concluded that although composite indicators met the need for consolidation and aggregation of a plethora of indicators into a sole number that encompasses and summarises information, they should be interpreted with extreme caution, especially when important conclusions are to be drawn relying on these measures.

After a review of several international quality frameworks for developing statistics and composite indices, Farrugia (2007) summarized the desirable attributes of a composite indicator as:

- (i) accuracy – properly estimates or defines the quantities or characteristics it is intended to measure).
- (ii) simplicity and ease of comprehension.
- (iii) methodological soundness – logical connection between the different sub-indices and mutually-consistent methodology justified by sound conceptual principles.
- (iv) suitability for international and temporal comparisons – the variables are measured in a homogenous manner.
- (v) transparency – ready availability of the methodology upon which the composite index was constructed.
- (vi) accessibility – ready available of the composite index across time and space.
- (vii) timeliness and frequency – the length of time between publication of the composite index and the event or phenomenon it describes and the frequency

with which the composite index is published; and (viii) flexibility – how relatively flexible the composite index is in allowing for changes in content, purpose, method, comparative application, and focus.

Moreira and Crespo (2016) asserted that composite indicators are mathematical combinations of a set of indicators whose extensive use had generated strong debate over conceptual and methodological arguments for and against the measurement approach. They reviewed the pros of composite indicators, including their multidimensionality; ease of interpretation compared to a battery of separate indicators; facilitation of comparisons of performance across space and over time, thereby attracting public interest; and the reduction of the size of a list of indicators without losing basic information.

On the other hand, their review of the disadvantages indicated that composite indicators always excluded some vital elements of the phenomenon; specific components may be quantified with the help of different variables; inability to reveal more than what a single variable alone reveals; inconsistency in the selection process of the variables; lack of clear rationale for the selected weighting and aggregation techniques; and an absence of practical value if they proffer no precise policy recommendation.

Gómez-Limón et al (2020) constructed a composite indicator to measure environmental sustainability using alternative weighting methods, namely, analytic hierarchy process, best-worst method and the point allocation method. The methodological approach adopted followed the sequence of indicator selection and data gathering, normalization, weighting, and aggregation. They found that the values of the composite indicators from the different methods yielded similar rankings of the olive farms studied, with a high level of consistency.

The United Nations Development Programme (UNDP, 2020) calculated the Human Development Index (HDI) by creating the indices for the three dimensions – health, education and standard of living – using min-max normalization technique, aggregating the dimensional indices using geometric mean technique and, in the case of the inequality-adjusted HDI, adjusting for inequality in the dimensional indices earlier derived and taking the unweighted average of these inequality-adjusted dimensional indices (UNDP, 2020).

The Gender Inequality Index (GII), with three dimensions – reproductive health, empowerment and labour market – and five indicators, indicates the following calculation steps: treatment of zero and extreme values; aggregation of indicators, firstly, across dimensions within each gender using

geometric mean, and secondly, across gender groups using harmonic mean; calculation of the geometric mean of the arithmetic means for each indicator; and calculation of the GII by dividing the harmonic mean by the geometric mean and subtracting the resulting quotient from 1, i.e., unity (UNDP, 2018).

De Muro et al (2011) developed the Mazziotta Pareto Index (MPI) to measure the Millennium Development Goals (MDGs) and compared the MPI with the HDI and the Human Poverty Index (HPI). The MPI adopted a linear aggregation method that penalized observed units (countries or geographical areas, for instance) with “unbalanced” values of the indicators, thereby assuming imperfect substitutability between various dimensions of development or poverty. The MPI and the HPI were similar because they penalized in the same direction, whereas the MPI and the HDI were dissimilar since the latter did not penalize for unbalanced set of indicators.

The Food Insecurity Multidimensional Index (FIMI), which synthesizes four dimensions of food security, viz, availability, access, utilization, and stability of food, with twenty indicators, into a composite indicator, progresses from a multivariate analysis of each dimension for internal consistency, through min-max normalization, to the aggregation of indicators for each dimension and for the four dimensions. The methodology adopts arithmetic mean with equal weights for aggregation of the indicators and power-three mean for the dimensions, to derive the synthetic index of food insecurity (Napoli et al, 2011).

The Global Hunger Index (GHI), which measures and tracks hunger at global, regional, and national levels, is intended to raise awareness and understanding of hunger problem, offer a basis for comparison of levels of hunger between nations, and attract focus to areas where hunger is prevalent, and with the greatest need for additional efforts to eliminate it. Its four indicators – undernourishment, child wasting, stunting and mortality – along three equally-weighted dimensions, are determined from available data for each country, standardized against thresholds set slightly above the highest country-level values observed worldwide for that indicator, and the standardized scores are aggregated to derive the GHI (GHI, 2020).

Cornell University et al (2020) showed that, included in the Global Innovation Index (GII) are a total of eighty indicators under seven pillars and three indices: the innovation input sub-index averages scores in five pillars; the innovation output sub-index averages scores in two pillars; and the GII is the average of the input and output sub-Indices which are assigned equal weights.



Extension of the composite indicator concept, which is steeped in the multidimensional approach to the measurement of development, to the assessment of socio-economic welfare and developmental programmes is not out of place. This is so because of the multi-faceted key performance indicators often associated with the measurement of progress in such programmes. Its application to the large portfolio of diverse MSME financing interventions of the CBN, could contribute to unravelling gaps and promoting opportunities for improvement in programme implementation. It would also permit a temporal comparison of achievements.

This extension is actualized by conceptualizing each intervention or programme as a country or region, and the dimensions as disbursements, outreach, and principal repayments. To keep the generalization simple, each dimension is hypothesized to have one indicator or component, as elaborated in the next section.

### 3.0 METHODOLOGY

Data on cumulative disbursements, number of projects and principal repayments in the enterprise financing interventions of the CBN were obtained from the Bank's Economic Report for the fourth quarter 2020. The financial data were reported in billions of naira unit and the interventions were:

- i. Commercial Agriculture Credit Scheme (CACs).
- ii. Paddy Aggregation Scheme (PAS).
- iii. Rice Distribution Facility (RDF).
- iv. Anchor Borrowers' Programme (ABP).
- v. Accelerated Agricultural Development Scheme (AADS).
- vi. Micro, Small and Medium Enterprises Development Fund (MSMEDF).
- vii. Shared Agent Network Expansion Facility (SANEF).
- viii. Small and Medium Enterprises Re-financing and Restructuring Facility (SMERRF).
- ix. Real Sector Support Facility (RSSF).
- x. Covid-19 Intervention for the Manufacturing Sector (CIMS).
- xi. Textile Sector Intervention Facility (TSIF).
- xii. CBN-BOI Industrial Facility (CBIF).
- xiii. Power and Airline Intervention Fund (PAIF).
- xiv. Nigeria Electricity Market Stabilization Facility (NEMSF).
- xv. Nigerian Bulk Electricity Trading - Payment Assurance Facility (NBET-PAF).
- xvi. National Food Security Programme (NFSP).
- xvii. Presidential Fertiliser Initiative (PFI).
- xviii. Non-Oil Export Stimulation Facility (NESF).
- xix. Export Development Facility (EDF).
- xx. Agri-business/ Small and Medium Enterprises Investment Scheme (AGSMEIS).
- xxi. Targeted Credit Facility (TCF).
- xxii. Maize Aggregation Scheme (MAS).
- xxiii. Healthcare Sector Intervention Facility (HSIF).

xxiv. Youth Empowerment Development Programme (YEDP).

The three variables earlier mentioned constituted our dimensions and indicators. In other words, each dimension comprised one indicator, which was itself. Since each dimension had just an indicator, it was not necessary to conduct multivariate analysis of the principal component analysis type or the like. In this regard, the analysis followed this sequence of procedures:

(i) Normalization or scaling – This was carried out to transform data values to the same scale to give them equal importance or prominence. The resultant distribution is a standard normal distribution with mean of zero and standard deviation equal to one, which is a desirable statistical property for stability. Two widely used scaling methods, the Z-score and the min-max, were applied, to assess the robustness of the composite indicator to different normalization methods.

The Z-score is the difference between an observation and the mean of the distribution, divided by the standard deviation. It is given as:

$$Z = \frac{X - \mu}{\sigma} \quad (3.1)$$

where Z	=	Z-score of each observation
X	=	Individual data point or observation
$\mu$	=	Mean of the distribution of datapoints
$\sigma$	=	Standard deviation of the distribution

The min-max normalization is implemented by the following function:

$$X_{norm} = \frac{X - X_{min}}{X_{max} - X_{min}} \quad (3.2)$$

where $X_{norm}$	=	Normalized value of individual data point
X	=	Individual data point or observation
$X_{min}$	=	Minimum data value in the distribution
$X_{max}$	=	Maximum data value in the distribution

(ii) Definition of dimension indices - to facilitate the min-max scaling, it was necessary to define the dimension indices, that is, the minimum and maximum values for each dimension. An option is to set such limits using values within the observed dataset. Another is to do so outside the observed data based on some historical evidence, behavioural assumptions about the phenomena, or empirical rationalizations. For instance, in calculating the HDI, the UNDP (2020) specified "natural zeros" and "aspirational targets" for the minimum and maximum values, respectively. It described these values as "goalposts" set to transform the indicators expressed in different units into indices between 0 and 1. These were not the observed extrema of the original distribution but theorized a priori values.

Specifically, the life expectancy indicator under the health dimension was given minimum value of 20 years because, historically, no country in the 20th century had a life expectancy of less than 20 years; and a maximum value of 85 years as this was a realistic aspirational target for many countries over the previous 30 years. Under education dimension, the expected years of schooling indicator had its minimum fixed at zero because societies can subsist without formal education, and the maximum at 18 years, which was equivalent to earning a master's degree in most countries, and so on. Explanations were also given for fixing the minimum and maximum values of the standard of living dimension, measured

by the gross national income per capita, at US\$100 and US\$75,000, respectively.

Akin to this, the Global Hunger Index (2020) set thresholds which were a bit higher than the highest country-level values observed worldwide for each indicator between 1988 and 2013. This was to allow room for possible future growth. As an illustration, it stated that the highest value for the undernourishment dimension was 76.5 per cent, but the threshold for standardization was set at 80 per cent.

For this study, observed data values were used to set the dimensions (Table 3.1).

**Table 3.1: Dimension indices for the study**

S/N	Dimension	Minimum	Maximum	Remarks
1	Disbursements	0.17	866.0	YEDP is min., NBET-PAF is max.
2	Outreach	1	2,504,690	RDF, NBET -PAF and EDF are min., ABP is max.
3	Repayments	0	443.9	RDF, AADS, CIMS, CBIF, NVET - PAF, EDF and TCF are min. , CACS is max.

Source: Authors (from observed data in Table 4.1).

(iii) Adjustments – the normalized scores were modified by the reciprocals of both size of enterprises financed and the age of the intervention, to eliminate their effects on the final indicator. This was considered apt because the larger the size of enterprise targeted under a programme, the higher the likelihood of large single disbursements and high values of cumulative disbursements; and the longer a programme has been in existence, the higher the probability of high cumulative disbursements and principal repayments.

The size of enterprises financed was taken as the average size by assets of the category of enterprises targeted. The National Policy on MSMEs provides the most consistent definition of micro, small and medium enterprises as, among others, having assets (excluding land and building) of less than ₦5.0 million, ₦5.0 to less than ₦50.0 million, and ₦50.0 million to less than ₦500.0 million, respectively. The mid-values of these ranges, which translated to their means, or their averages if more than one enterprise size was targeted, were the size deflators. For instance, the ABP disbursements target micro farmers, whose assets should be between 0 and ₦5.0 million. The approximate mid-value was ₦2.5 million, which was adopted. For the MSMEDF which targets micro, small and medium, the average of the approximate mid-values was the deflator. That is, the average of ₦2.5

million, ₦25.0 million and ₦250.0 million, which was ₦92.5 million.

The age of the programme defines its path over time from introduction to date. With the passage of time, evolutionary characteristics arising from the review of modalities tend to set in and drive, or should drive, implementation. Controlling for this was to allow programmes that had operated for relatively shorter periods because of when they were introduced, to be representatively captured without lifespan bias. Whereas it was relatively easy to specify the duration of operation for the interventions that were existent up to 2019, the COVID-19 era interventions, namely, TCF, CIMS and HSIF, were specified as approximately one year old since they had each been operated for at least half a year by end-2020.

More exclusively, normalized disbursements and outreach were adjusted for both size of enterprises and programme age since a high correlation was hypothesized between them. Conversely, normalized repayments were adjusted for age of the programme only. It was assumed that enterprise size does not affect repayments directly but indirectly since repayments itself was a function of disbursements.

Before these adjustments were made, there was need to address negative and zero values arising

from the normalization process. This is a condition precedent to geometric means aggregation, which breaks down in the presence of both. It also improves interpretability of the results, as negative or zero indicator values would be unseemly and confusing. All the values – not only the zero or negative values – in a normalized distribution or series would have to be treated similarly, to retain the normal distribution properties. The addition of a constant that is high enough to make the series positive suffices. Having noted this, the minimum positive normalized value for the series scaled by the min-max method was added to each normalized value while twice the negative of the minimum normalized value for the series scaled by the Z-score method was added to its series.

(iv) Aggregation – as is standard practice in the methodology, arithmetic and geometric mean aggregation methods were adopted to bring the three sub-indices together to produce a single indicator. The geometric mean is useful in reducing the effect of outliers which were not in short supply in the datasets here, especially in the outreach dimension with extremes of 1 and 2,504,690.

The arithmetic mean is the quotient from the summation of adjusted normalized scores and the number of values so summed up. That is,

$$\mu = \frac{X_1 + X_2 + X_3 + \dots + X_n}{n} = \frac{\sum X}{n} \quad (3.3)$$

- where  $\mu$  = Mean of the distribution of scaled datapoints
- $X_1, \dots, X_n$  = Adjusted normalized scores
- $n$  = Number of adjusted normalized values

Geometric mean analysis centred on the execution of (3.4) which is the nth root of the product of the adjusted normalized values, given as:

$$\left( \prod_{i=1}^n X_i \right)^{1/n} = \sqrt[n]{X_1 X_2 X_3 \dots X_n} \quad (3.4)$$

- where  $\Pi$  = Mean of the distribution of scaled datapoints
- $n$  = Number of adjusted normalized values
- $X_1, \dots, X_n$  = Adjusted normalized scores

(v) Categorization – to summarize the activity level of the interventions, they were categorized, building on the composite indicators derived in the last stage, into broad groups, namely, remarkably high, high, moderate, low, and extremely low activity. It is known that the different methodologies applied to calculate the indicators would produce different indicator series and, hence, rankings of the programmes. It would also be preposterous to base subsequent discussion on the indicator from one or a few of the methods. To harmonize these series and obtain a single indicator value for clarity and ease of interpretation, the values of the indicator for each programme, as derived from the different methodologies, were summed up to derive a

magnitude value and this sum or magnitude value was the single composite indicator. This was then ranked for all interventions and the ranking partitioned into upper, upper middle, middle, lower middle and lower segments corresponding to the five broad activity groupings, stemming from determination of the 80th, 60th, 40th and 20th percentiles. The values derived in this stage defined the activity series and were used to characterize the programmes. The summation of indicators from all the methodologies and the mapping of the sum onto a 5-segment percentile scheme for characterization purposes marked the novelties of this study.

## 4.0 Results and Discussion

### 4.1 Findings

The dataset for the study is presented in Table 4.1, which shows the cumulative number of loans (volume), disbursements and repayments.

#	Intervention/ Programme	Cumulative			Deflator	
		# of Projects (Outreach)	Disbursements (₦'bn)	Repayments (₦'bn)	Beneficiary Average Asset Base (₦'bn)	No. of Years in operation (as @ Dec. 2020)
1	CACS	636	672.90	443.90	0.25	11
2	PAS	21	95.50	93.50	0.25	3
3	RDF	1	1.00	0.00	0.25	2
4	ABP	2,504,690	497.20	118.70	0.0025	5
5	AADS	9,983	14.90	0.00	0.0025	2
6	MSMEDF	216,704	83.90	34.70	0.0925	7
7	SANEF	13	5.50	0.64	0.025	2
8	SMERRF	604	300.90	151.10	0.25	10
9	RSSF	25	166.20	22.50	0.25	6
10	CIMS	111	228.20	0.00	0.25	0.5
11	TSIF	41	78.00	3.10	0.25	4
12	CBIF	60	100.00	0.00	0.25	3
13	PAIF	74	311.20	194.60	0.25	10
14	NEMSF	37	189.20	70.30	0.25	5
15	NBET-PAF	1	866.00	0.00	0.25	3
16	NFSP	4	59.10	11.40	1.0	4
17	PFI	18	35.00	10.80	0.25	3
18	NESF	13	44.00	12.00	0.25	5
19	EDF	1	50.00	0.00	0.25	2
20	AGSMEIS	22,057	83.50	0.21	0.0025	3
21	TCF	317,949	149.20	0.00	0.0025	0.75
22	MAS	7	6.00	6.00	0.25	2
23	HSIF	62	60.70	0.78	0.25	0.5
24	YEDP	67	0.17	0.51	0.0025	4
	<b>Total</b>	<b>3,073,179</b>	<b>4,098.27</b>	<b>1,174.74</b>	<b>5</b>	<b>98</b>
	<b>Min</b>	<b>1</b>	<b>0.17</b>	<b>0.00</b>	<b>0.0025</b>	<b>0.5</b>
	<b>Max</b>	<b>2,504,690</b>	<b>866.00</b>	<b>443.90</b>	<b>1.00</b>	<b>11.00</b>
	<b>μ</b>	<b>128,049</b>	<b>170.76</b>	<b>48.95</b>	<b>0.21</b>	<b>4.07</b>
	<b>δ</b>	<b>511,969</b>	<b>221.42</b>	<b>100.04</b>	<b>0.20</b>	<b>2.93</b>

Source: CBN Economic Report Q4: 2020 and authors' compilation

The last two columns show the average asset base of enterprises targeted by each intervention and the age of the intervention. A total of 12.5 per cent (or three) of programmes financed a single project while about 30 per cent (or seven) recorded zero principal repayments within the study period.

Programmes with a single project financed were the EDF, where wholesale disbursement was to a development finance institution; and NBET-PAF, where funds were disbursed to a public institution as

obligor. The seven programmes for which there were no principal repayments included interventions such as the CBIF and the NBET-PAF, which were operational before the onset of COVID-19 and whose moratoria were extended in the wake of the pandemic. The wide ranges and standard deviations for all three series were generally suggestive of non-normal distributions which the normalization methods addressed.



In Table 4.2, normalized scores can be seen to narrow the distance between observations.

**Table 4.2: Normalized scores**

#	Programme	MIN-MAX NORMALIZATION			Z-SCORE NORMALIZATION		
		# of Projects	Disbursements	Repayments	# of Projects	Disbursements	Repayments
1	CACS	0.0002535	0.7769770	1.0000000	-0.2488686	2.2678109	3.9480757
2	PAS	0.0000080	0.1101024	0.2106330	-0.2500698	-0.3399026	0.4453615
3	RDF	0.0000000	0.0009586	0.0000000	-0.2501089	-0.7666933	-0.4892954
4	ABP	1.0000000	0.5740503	0.2674026	4.6421534	1.4742964	0.6972690
5	AADS	0.0039853	0.0170126	0.0000000	-0.2306116	-0.7039167	-0.4892954
6	MSMEDF	0.0865189	0.0967049	0.0781708	0.1731644	-0.3922918	-0.1424227
7	SANEF	0.0000048	0.0061559	0.0014418	-0.2500855	-0.7463699	-0.4828977
8	SMERRF	0.0002407	0.3473315	0.3403920	-0.2489311	0.5877461	1.0211501
9	RSSF	0.0000096	0.1917582	0.0506871	-0.2500620	-0.0206000	-0.2643779
10	CIMS	0.0000439	0.2633658	0.0000000	-0.2498940	0.2594108	-0.4892954
11	TSIF	0.0000160	0.0898906	0.0069836	-0.2500308	-0.4189379	-0.4583068
12	CBIF	0.0000236	0.1152998	0.0000000	-0.2499937	-0.3195793	-0.4892954
13	PAIF	0.0000291	0.3592276	0.4383870	-0.2499663	0.6342640	1.4559905
14	NEMSF	0.0000144	0.2183223	0.1583690	-0.2500386	0.0832750	0.2134466
15	NBET-PAF	0.0000000	1.0000000	0.0000000	-0.2501089	3.1399091	-0.4892954
16	NFSP	0.0000012	0.0680619	0.0256815	-0.2501030	-0.5042961	-0.3753372
17	PFI	0.0000068	0.0402273	0.0243298	-0.2500757	-0.6131390	-0.3813350
18	NESF	0.0000048	0.0506219	0.0270331	-0.2500855	-0.5724923	-0.3693394
19	EDF	0.0000000	0.0575517	0.0000000	-0.2501089	-0.5453944	-0.4892954
20	AGSMEIS	0.0088059	0.0962429	0.0004731	-0.2070282	-0.3940983	-0.4871962
21	TCF	0.1269411	0.1721239	0.0000000	0.3709203	-0.0973771	-0.4892954
22	MAS	0.0000024	0.0067334	0.0135166	-0.2500972	-0.7441118	-0.4293174
23	HSIF	0.0000244	0.0699098	0.0017572	-0.2499898	-0.4970700	-0.4814982
24	YEDP	0.0000264	0.0000000	0.0011489	-0.2499800	-0.7704418	-0.4841973

Source: Authors' compilation

The zero values in the min-max-normalized series and the negative values in the Z-score-normalized series were treated as in Section 3.0, by the addition of constants. That is, for the min-max-normalized distributions, the minimum positive normalized value for the series, that is, 0.0000012, 0.0009586 and 0.0004731, were added to relevant normalized values.

For Z-score-normalized distributions, twice the negative of the minimum normalized value, that is, -0.2501089, -0.7704418 and -0.4892954, were added to relevant scaled series, to produce all-positive values, as shown in Table 4.3.

**Table 4.3: NORMALIZED SCORES PLUS CONSTANTS**

#	Programme	MIN-MAX NORMALIZED SCORES + CONSTANT			Z-SCORE NORMALIZED SCORES + CONSTANT		
		# of Projects	Disbursements	Repayments	# of Projects	Disbursements	Repayments
1	CACS	0.0002547	0.7779356	1.0004731	0.2513492	3.8086946	4.9266664
2	PAS	0.0000092	0.1110611	0.2111061	0.2501480	1.2009810	1.4239523
3	RDF	0.0000012	0.0019172	0.0004731	0.2501089	0.7741904	0.4892954
4	ABP	1.0000012	0.5750090	0.2678756	5.1423712	3.0151801	1.6758598
5	AADS	0.0039865	0.0179712	0.0004731	0.2696062	0.8369670	0.4892954
6	MSMEDF	0.0865201	0.0976635	0.0786438	0.6733822	1.1485919	0.8361680
7	SANEF	0.0000060	0.0071146	0.0019148	0.2501323	0.7945137	0.4956930
8	SMERRF	0.0002419	0.3482901	0.3408651	0.2512867	2.1286297	1.9997409
9	RSSF	0.0000108	0.1927168	0.0511602	0.2501558	1.5202837	0.7142128
10	CIMS	0.0000451	0.2643244	0.0004731	0.2503238	1.8002945	0.4892954
11	TSIF	0.0000172	0.0908492	0.0074566	0.2501870	1.1219457	0.5202840
12	CBIF	0.0000248	0.1162584	0.0004731	0.2502241	1.2213044	0.4892954
13	PAIF	0.0000303	0.3601862	0.4388601	0.2502515	2.1751476	2.4345813
14	NEMSF	0.0000156	0.2192809	0.1588421	0.2501792	1.6241586	1.1920374
15	NBET-PAF	0.0000012	1.0009586	0.0004731	0.2501089	4.6807927	0.4892954
16	NFSP	0.0000024	0.0690205	0.0261545	0.2501148	1.0365876	0.6032535
17	PFI	0.0000080	0.0411859	0.0248029	0.2501421	0.9277447	0.5972557
18	NEF	0.0000060	0.0515806	0.0275062	0.2501323	0.9683914	0.6092513
19	EDF	0.0000012	0.0585103	0.0004731	0.2501089	0.9954892	0.4892954
20	AGSMEIS	0.0088071	0.0972015	0.0009462	0.2931896	1.1467854	0.4913946
21	TCF	0.1269423	0.1730825	0.0004731	0.8711381	1.4435065	0.4892954
22	MAS	0.0000036	0.0076920	0.0139896	0.2501206	0.7967719	0.5492734
23	HSIF	0.0000256	0.0708684	0.0022302	0.2502280	1.0438137	0.4970925
24	YEDP	0.0000275	0.0009586	0.0016220	0.2502378	0.7704418	0.4943935

Source: Authors' compilation

It should be noted that this transformation changed neither the dynamics of the analytical process nor the desirable statistical properties of the series. It was intended to permit the application of geometric mean and improve interpretability of the results since, otherwise, the analysis breaks down with error results in the case of the geometric mean, and negative or zero values in the case of the arithmetic mean aggregation – both outcomes of which are anti-climactic for the purpose of this research exercise.

Making all values positive was followed by the adjustment for size of enterprise financed and age of the programme, the results of which are shown in

Table 4.4. Both deflators acted in a compensatory manner on the scores, boosting the scores on programmes targeting smaller enterprises and having shorter durations, while invariably penalizing those financing larger enterprises and having longer durations of existence. This deflation or adjustment effectively addressed concerns over programme lifespan and coverage by further closing the distance between the values.

**Table 4:4: ADJUSTED NORMALIZED SCORES PLUS CONSTANTS**

#	Programme	ADJUSTED MIN-MAX NORMALIZED SCORES + CONSTANT			ADJUSTED Z-SCORE NORMALIZED SCORES + CONSTANT		
		# of Projects	Disbursements	Repayments	# of Projects	Disbursements	Repayments
1	CACS	0.0000926	0.2828857	0.0909521	0.0913997	1.3849798	0.4478788
2	PAS	0.0000033	0.0403858	0.0191915	0.0833827	0.4003270	0.4746508
3	RDF	0.0000004	0.0006972	0.0000430	0.1250545	0.3870952	0.2446477
4	ABP	0.3636368	0.2090942	0.0243523	1.0284742	0.6030360	0.3351720
5	AADS	0.0014496	0.0065350	0.0000430	0.1348031	0.4184835	0.2446477
6	MSMEDF	0.0314619	0.0355140	0.0071494	0.0961975	0.1640846	0.1194526
7	SANEF	0.0000022	0.0025871	0.0001741	0.1250662	0.3972569	0.2478465
8	SMERRF	0.0000880	0.1266509	0.0309877	0.0251287	0.2128630	0.1999741
9	RSSF	0.0000039	0.0700788	0.0046509	0.0416926	0.2533806	0.1190355
10	CIMS	0.0000164	0.0961180	0.0000430	0.2503238	1.8002945	0.4892954
11	TSIF	0.0000062	0.0330361	0.0006779	0.0625468	0.2804864	0.1300710
12	CBIF	0.0000090	0.0422758	0.0000430	0.0834080	0.4071015	0.1630985
13	PAIF	0.0000110	0.1309768	0.0398964	0.0250251	0.2175148	0.2434581
14	NEMSF	0.0000057	0.0797385	0.0144402	0.0500358	0.3248317	0.2384075
15	NBET-PAF	0.0000004	0.3639850	0.0000430	0.0833696	1.5602642	0.1630985
16	NFSP	0.0000009	0.0250984	0.0023777	0.0625287	0.2591469	0.1508134
17	PFI	0.0000029	0.0149767	0.0022548	0.0833807	0.3092482	0.1990852
18	NESF	0.0000022	0.0187566	0.0025006	0.0500265	0.1936783	0.1218503
19	EDF	0.0000004	0.0212765	0.0000430	0.1250545	0.4977446	0.2446477
20	AGSMEIS	0.0032026	0.0353460	0.0000860	0.0977299	0.3822618	0.1637982
21	TCF	0.0461608	0.0629391	0.0000430	0.8711381	1.4435065	0.4892954
22	MAS	0.0000013	0.0027971	0.0012718	0.1250603	0.3983859	0.2746367
23	HSIF	0.0000093	0.0257703	0.0002027	0.2502280	1.0438137	0.4970925
24	YEDP	0.0000100	0.0003486	0.0001475	0.0625595	0.1926105	0.1235984

Source: Authors' compilation

In the penultimate step of the analysis, the composite indicator series for the development financing interventions of the CBN is calculated for each programme using the arithmetic and geometric mean aggregation methods and the result presented in Table 4.5. The table shows the indicator as derived from four methodologies, namely, min-max geometric, min-max arithmetic, Z-score geometric

and Z-score arithmetic. In the min-max geometric indicator series, the ABP, MSMEDF and CACS ranked top three, while the YEDP, EDF and RDF ranked bottom three. In the Z-score geometric indicator series, the corresponding rankings were the TCF-CIMS-ABP and RSSF-NESF-SMERRF.





**Table 4.6: Activity Series of CBN Devfin Interventions**

Programme	Indicators Series				Composite Index	Percentile value/ range/ category
	MGM	MAM	ZGM	ZAM		
TCF	0.01336	0.03638	0.85054	0.93465	1.83	<b>Remarkably High</b>
ABP	0.12280	0.19903	0.59238	0.65556	1.57	
CIMS	0.00702	0.03206	0.60414	0.84664	1.49	
CACS	0.01999	0.12464	0.38416	0.64142	1.17	<b>Upper</b>
HSIF	0.00214	0.00866	0.50637	0.59704	1.11	
NBET-PAF	0.00500	0.12134	0.27683	0.60224	1.01	<b>High</b>
PAS	0.00386	0.01986	0.25116	0.31945	0.59	<b>Upper Middle</b>
EDF	0.00041	0.00711	0.24787	0.28915	0.54	
AADS	0.00074	0.00268	0.23987	0.26598	0.51	
MAS	0.00019	0.00136	0.23918	0.26603	0.51	<b>0.50</b>
SANEF	0.00017	0.00092	0.23092	0.25672	0.49	<b>Moderate</b>
RDF	0.00010	0.00025	0.22794	0.25227	0.48	<b>Middle</b>
AGSMEIS	0.00052	0.01288	0.18291	0.21460	0.41	
CBIF	0.00037	0.01411	0.17692	0.21787	0.41	
NEMSF	0.00109	0.03139	0.15707	0.20443	0.39	<b>Low</b>
PFI	0.00008	0.00574	0.17251	0.19724	0.38	<b>Lower Middle</b>
PAIF	0.00187	0.05696	0.10984	0.16200	0.33	
SMERRF	0.00137	0.05258	0.10227	0.14599	0.30	
NFSP	0.00007	0.00916	0.13470	0.15750	0.30	
TSIF	0.00047	0.01124	0.13165	0.15770	0.30	
MSMEDF	0.00046	0.02471	0.12354	0.12658	0.28	<b>Extremely Low</b>
RSSF	0.00036	0.02491	0.10794	0.13804	0.27	
YEDP	0.00002	0.00017	0.11420	0.12626	0.24	
NESF	0.00025	0.00709	0.10569	0.12185	0.23	

Source: Authors' compilation

N/B: MGM: Min-max Geometric Method; MAM: Min-max Arithmetic Method; ZGM: Z-score Geometric Method; ZAM: Z-score Arithmetic Method

Programmes in the remarkably high activity category are outreach-driven and had attracted the strongest rave reviews in recent times and, in a nutshell, represent the fullness of development finance practice by the CBN. They are generally synonymous with rapid growth and in all indices; accounted for 91.9, 39.2 and 48.0 per cent of outreach, disbursements, and principal repayments, respectively; and span all broad sectors: agriculture (ABP and CACS), industry (CIMS), services (HSIF) and multi-sector (TCF). The CACS is the oldest programme under study. But, notably, in this category are also two programmes of less than a year old, the COVID-19-era TCF for households and MSMEs and the HSIF for the health sector. Both made it into the group due to high intensity outreach and disbursements. Programmes here also received wide embrace because they focused on high employment-elastic

activities. For instance, the ABP, which rides on the contract farming model, financed small-scale farmers who constitute a huge proportion of the economically active labour force. It is often argued that there was a substitution effect of the ABP, TCF and CIMS on the Agricultural Credit Guarantee Scheme (ACGS), AGSMEIS and RSSF, respectively, the former three gaining prominence over the latter.

For the high activity category, its relative strength lay in disbursements. They provided 0.3, 25.2 and 8.5 per cent, respectively, of outreach, disbursements, and principal repayments. Representative activities were on-grid electricity power supply services (NBET-PAF), agriculture (PAS, AADS and MAS), and non-oil exports in general (EDF). The pace of expansion of operations in programmes in this group was lower than that for the remarkably high category. The agriculture

interventions PAS and MAS specifically targeted aggregation activities in cereal value chains – rice and maize, respectively. With exception of AADS which was for small-scale primary producers, all programmes were for secondary and tertiary sector SMEs. In general, the low outreach which, in fact, was the lowest for all categories, seemed to symptomize the narrow or restrictive activities of coverage of the programmes. It was, noted, for instance, that despite its oligopolistic structure with implied free entry, existing structural rigidities and high investment costs tended to limit new entrants from obtaining operating licences to access the electricity market. This meant less potential SMEs to reach with available intervention financing, although the NBET-PAF did account for a disproportionately high proportion of disbursements. If there was any substitution effect, that was between NBET-PAF and EDF on the one hand, and NEMSF and NESF on the other hand.

Moderate category interventions covered financial agency services (SANEF), distribution services (RDF), multi-sectoral activities (AGSMEIS) and industry (CBIF). Collectively, they were responsible for 0.7, 4.6 and 0.1 per cent of outreach, disbursements, and principal repayments, respectively. 75 per cent of the programmes here, the highest of such proportion for any category, were implemented by external managing agents, with exception of the RDF. Also, as most of the programmes were introduced at most two years before the COVID-19 outbreak, subsisting moratoria on their facilities were simply extended by the Bank's extension of moratorium on all its intervention facilities. This was most likely the reason for the lowest proportion of repayments recorded among all groups, as uptake was rather slow before then. There appeared to be slow traction in outreach and disbursements for the financial inclusion intervention, SANEF, and the RDF which supports distribution of staple rice. There also seemed to be some substitution between the AGSMEIS and the MSMEDF because of similarity in their focus, making the older MSMEDF wane in significance.

In the fourth or low activity programmes category, the marked features were the high average programme age of six years, high repayments relative to outreach and disbursements, and the absence of a programme financing general smallholder agriculture directly. The NFSP is for large-scale agriculture; NEMSF and PAIF are for services, namely power sub-sector, with the latter also for aviation sub-sector; SMERRF, manufacturing sub-sector in general; and PFI and TSIF for specific manufacturing activities, fertilizer and textile and garments, respectively. Contributions to global outreach, disbursements and principal repayments were 0.03, 23.8 and 37.6 per cent, respectively. These are renowned programmes that have contributed

immensely to economic growth and are at advanced stages of implementation, hence are relatively repayments driven. As a matter of fact, the SMERRF was discontinued back in 2014; the only operational activities since then have been monitoring and ongoing repayments which should continue until the longest loan durations elapsed. Most activities covered by the interventions here are not the preponderant type, hence growth in outreach and disbursements is somewhat sluggish. This largely explains the significantly low outreach contribution. As a result, there are no immediately discernible displacements or substitutions to the lower activity category.

The extremely low activity interventions are so described because of their position at the end-2020 milestone relative to their high average age of 5.5 years, implying they are at about mid-age stage, given the conventional ten-year lifespan of most CBN interventions. They contributed 7.1, 7.2 and 5.9 per cent to outreach, disbursements, and principal repayments, respectively. Programmes in this category are all multi-sectoral and they are the MSMEDF, RSSF, the youth-focused YEDP and the export-oriented NESF. Over 99.9 per cent of the 7.1 per cent contribution to disbursements were contributed by the MSMEDF whose huge disbursements were duly discounted, deflated, or penalized, by its seven years of operation to leave it in this category, an indication that, given its age, it should have been better in all indices.

## 4.2 Policy Implications

The high rankings produced by the COVID-19 era programmes (TCF, CIMS and HSIF) present an apt lesson on what intervention policies should be like. Their rapid uptake (within so short a time frame) was, unequivocally, a product of strong intervention effort (in programme formulation, implementation, and monitoring) and high responsiveness of intended users, i.e., the households and the enterprises. Some programmes were driven by outreach, others by disbursements, some by more than one indicator, etc. What, in turn, drove these indicators? From the findings, preponderance of an economic activity partly drove its outreach. Operating financial profile, reasonably approximated by size of enterprises, influenced disbursements. These indicators and their enablers were critical for success.

For the entire series and within specific categories, some programmes in certain sectors and those aimed at certain economic segments, generally ranked higher than others. In this regard, specific programmes for agriculture (ABP, CACS, PAS), health (HSIF), and power (NBET-PAF, NEMSF) readily ranked better and, to a lesser extent, multi-sectoral, multi-

segment interventions (TCF, MSMEDF). It was obvious that many multi-sectoral programmes did not rank well (MSMEDF, RSSF, YEDP and NESF). Perhaps, this was because these generic programmes lacked the added push of sustained mobilization or clout by apex stakeholder organizations or interested public sector organizations, which programmes with specific focus, such as PAS, MAS, TSIF, NBET-PAF and PFI, for instance, had.

Within specific categories, programmes managed by external parties looked to ranked better than those managed within the CBN. In all four categories (except extremely low category) having a mix of interventions with different management approaches, those overseen by external managing agents ranked better (TCF, NBET-PAF, SANEF, NEMSF). This, by no means, takes the credit off the CBN that has managed programmes such as the ABP, CIMS and HSIF, that are within the topmost, remarkably high activity category, of interventions. Some programmes evidently displaced or substituted others, because either the substituting programmes were more reflective of present-day realities or the substituted interventions were at a less active stage of their life cycle. In the instances of substitutionary relationships, should older programmes be retained in the face of the introduction of the newer? In the winding down substitution instance, what should appropriately constitute the lifespan of especially micro or small borrower programmes? In general, it is instructive that averagely older programmes, fast approaching their sunset, tended to settle into the bottom two groups, that is, low and extremely low categories.

## 5.0 CONCLUSION AND RECOMMENDATIONS

The study purposed to develop a composite indicator of activity level to establish a broad ranking of CBN development financing programmes, based on cumulative loan disbursements, outreach (loan volumes) and principal repayments. This was used to serialize and characterize these programmes and discover patterns of implementation effort, patronage, and responsiveness of target enterprises to available incentives. It was noted that this exercise was neither an attempt to assess intervention performance or substitute for impact evaluations but an effort to use publicly available information on the financing programmes and tested methodologies to rank the programmes based on activity status. If any of indicators, methodologies, scope, and study period were changed, this could result in completely different outcomes and interpretations.

At the programme onset or initiation stage, there is need to identify all the indicators that will drive a programme and their enablers. Efforts should then be

made to frequently report on these indicators and measures designed to emphasize them for greater implementation effectiveness. Since some interventions in specific sectors and economic segments did better, the managers may harness this information to strive towards specialization and increased efficiency. There is need to either refresh older programmes if they are not being wound down or ceded out to be managed by other institutions. The reason for the low ranking of most multi-sectoral programmes should be identified and addressed. Finally, programme life cycles should be monitored and assessed against specified milestones set at programme initiation and the role of regular impact assessment in this respect cannot be over-emphasized.

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## Oil Price and Foreign Direct Investment in Nigeria: New Evidence from Structural Breaks and a Nonlinear Analysis



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### Abstract

The study employed Non-Linear Auto-Regressive Distributed Lag (NARDL) method to analyse the link between oil price and foreign direct investment in Nigeria (FDI) using annual data from 1970 to 2018. Bai-Perron (2003) test revealed two structural break periods (1989 and 1995) showing a long run relationship between oil price and FDI in Nigeria. The findings, after NARDL estimation (short and long runs), showed that oil price, exchange rate and trade, negatively and insignificantly influenced FDI, while GDP positively impacted on FDI, though insignificant too. The study concluded that though these variables slow down FDI, efforts should be geared towards channeling oil funds to other sectors to encourage foreign investors.

**Keywords:** FDI, NARDL, Oil price

**JEL Classification:** C5, F2

### Introduction

In any economy, both developed and developing, the discovery of oil is always marked with a frolic advent of economic growth and development due to the expected flow of revenue from this sector as more investments would be attracted into the economy (Edame et al., 2014). Investments in the oil sector are strategic because of the risk associated with the decision. Strategic investment is one of the most important decisions that businesses make since such investments can lead to competitive advantage through cost reduction and product differentiation, which in turn leads to value creation (e.g., Porter 1980; Makadok, 2003; & Henrique and Sardosky, 2011).

The risk associated with foreign investment decisions in this sector is a result of imperfect information, which is associated with fluctuations in oil price. Pindyck (1991) and Dixit and Pindyck (1994) identified uncertainties firms faced to include oil price fluctuations, factor input cost uncertainty, exchange rate uncertainty, or even regulatory uncertainty. Miller (1998) also noted that uncertainties do affect not only the expectations of an investment decision but also affect firms' worth. Henrique and Sardosky (2011) empirically marked fluctuations in oil prices to be one of the problems of uncertainties that may affect firms' decisions both in the present and more concerned in the future. Baranek (1983), in his model of explaining how oil price affects real options of investors, noted that the opportunity cost of a firm waiting for new information regarding the fluctuations in the oil price is the returns he/she gets on the early investment, but the value of waiting increases as the fluctuations in the oil prices increases, while the incentive to investment falls.

To an economy, growth depends on a firm's decision on investment but declines when investors loose interest in the economy. Kulatilaka and Perotti (1998) and Henrique and Sardosky (2011) similarly identified the same problem in recent works of literature in line with Baranek (1983) that when firms do not have a monopolistic power over investment opportunities and the market is not competitive enough to accommodate fluctuations in oil prices and alternative costs of generating energy, firms are faced with two options: the option of waiting to resolve the fluctuations in the prices of oil which will contribute to their production cost and an option to grow investment. This scenario, in most cases, is often noted with extreme seriousness by investors in developing countries such as Nigeria.

In line with Morey (1993) and Tang et al. (2010), Shahbaz et al. (2017) admitted that rise in genuine economic activities comes through supply and

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demands and vice versa. The supply-side channel reveals that oil is a fundamental factor of production, and an increase in oil price implies an increase in the cost of production, which leads firms or industries to lower output, mostly in developing countries such as Nigeria.

However, Nigeria, considered as one of the major oil producers and oil being its mainstay, still lags in terms of growth and development. This deficiency has been identified in existing studies to be a result of a low level of inflow investment into the economy, which is caused by several uncertainties, including oil price. Thus, this study has deviated from concentrating on unidirectional effect of oil price on FDI to investigating both directional effect which can best be explained using Non-Linear Auto-regressive Distributed Lag (NARDL) method. Also, the study accounts for structural breaks, which to the best of my knowledge no study has examined its impact on foreign direct investment in the context of Nigeria.

The rest of the study is divided into four Sections, Section two comprises review of related studies, while Section three shows the data source and methodology, Section four presents the analytical framework, while Section five displays the conclusion and recommendations.

## 2.0 Literature Review

Various theories have discussed the feedback effect of a country depending on natural resources as its main source of income. The Dutch disease syndrome is an example of a theory among the theories. The Dutch disease syndrome explains the negative effect of discoveries that gives sharp rise to a country's currency, leaving other sectors less competitive in the global market. An example emphasised by the theory is large oil discovery in an economy using the Netherlands as an example. Other theories are Prebisch's (1949) "dependency theory, Mahdavy's (1970) "Rentier's theory," among others.

Dal Bianco and Nguyen (2017) in Latin America confirmed the establishment of real options theory in Latin American countries, which indicates the negative impact of exchange rate volatility on foreign direct investment; and the absence of connection between foreign direct investment and oil price fluctuation. The presumed instruments that attract foreign direct investment in Latin American countries are human capital and trade openness. In contention, Dias et al. (2014) posited that in Brazil, the exchange rate does not play any role in explaining foreign Direct Investment (FDI) inflow. On the other hand, the productivity shocks of the United States economy hurt FDI inflow due to the impact of productivity on the relative prices in the economies. In

Colombia, Quero-Virlaa (2016) argued that oil price fluctuation has a significant impact on foreign direct investment.

Kari and Saddam (2014) posited that findings for dynamic links between foreign direct investment, growth, and oil export in Gulf Cooperation Council (GCC) countries showed that oil price shocks repulse foreign direct investment and distort economic growth; whereas, a shock in foreign direct investment inflow adversely affect oil export and the economic growth. For six oil-exporting GCC countries, Elheddad (2016) realised a negative relationship between natural resources abundance and foreign direct investment (FDI) and a negative correlation between foreign direct investment inflow and GDP of the countries. Also, Asiedu (2013) opined that findings for 99 developing countries showed that natural resources negatively influence foreign direct investment, whereas good institutions lessen the negativity of natural resources on foreign direct investment.

Considering inflation rate and foreign direct investment as the key macro-economic variables in South Asian Countries, Muhammad and Sayed (2012) submitted that a significant positive link exists between inflation rate and foreign direct investment. On the contrary, for the economy of Pakistan, Mehta (2014) discovered a negative impact of oil price fluctuation on investment through inflation and deteriorated economic growth. Using GARCH and SVAR in examining oil price volatility and investment responses in Thailand, Wadud and Huson (2014) proved in the economy of Thailand that oil price fluctuation negatively affects the aggregate real investment of the economy. In India, Sadath and Acharya (2015) affirmed that the sales-growth-investment relationship becomes weak in the face of the rising prices of energy due to the cautious approach to investment adopted by the firms.

In investigating the role of product market competition in moderating the effect of oil price shocks and market uncertainty on stock return employing firm-level monthly data from 70 countries spanning from 1983 to 2014, Gupta (2016) analysis for 70 countries on oil price shocks and market uncertainty effect on stock returns, showed that macroeconomic stress negatively impacted on the firm-level returns. While oil price shocks positively impact firm-level returns, firms located in high oil-producing countries are more sensitive to global uncertainty and oil price shocks. On the other hand, firms located in non-competitive industries are less sensitive to oil price shocks; and firms located in non-competitive industries are less affected by the drop in oil price, compared with firms that are located in highly competitive industries.

Herinques and Sardosky (2011) observed that using Generalised Method of Moment (GMM) for a panel data set in the US, that there was a U-shaped relationship between oil price volatility and strategic firm investment decision in the US. Killins et al. (2017) study in Canada revealed that the reaction of housing markets to oil price shocks varies significantly depending on whether the changes in oil price is prompted by demand or supply shocks in the oil market and on country oil trade status (i.e., net importer or net exporter). Using daily data to investigate the relationship between oil volatility and stock return volatility for 560 firms listed on the New York stock exchange, Narayan and Shama (2014) noted that oil price was a significant and predictor of firm return variance. In the same vein, Narayan and Narayan (2016) further argued that in the United States (US), there was a robust effect of oil price speed of adjustment on macroeconomic variables in the economy.

In a study of foreign direct investment in Islamic oil-exporting countries, Razmi and Behname (2012) noticed a negative effect of oil extraction on foreign direct investment as a result of over-dependence on oil extraction, which plagues a high risk on these economies. In the economy of Russia, Shafi and Liu (2014) found a positive impact of oil price and exchange rate on economic growth and foreign direct investment and other macroeconomic variables were found to have a significant positive relationship with exchange rate except for export that exhibited a negative relationship with real effective exchange rate in the short-run. Sharifi-Renani and Mirfatah (2012), in evaluating the determinants of FDI inflow in Iran using co-integration approach, discovered that trade openness, GDP, and exchange rate possess a significant positive impact on FDI, while exchange rate and world crude oil prices exhibited a significant negative impact on the flow of FDI in Iran. Moshiri (2015) further revealed that there was the existence of heterogeneous responses between energy price and income changes in different income groups in Iran.

Using Lagrangean Multiplier (LM) unit root test to investigate the nexus between foreign direct investment, oil prices, and global financial crisis in Singapore; Wong et al. (2015) discovered that external shocks of oil price and foreign direct inflow were closely related in the short-run, whereas the external shocks of foreign direct investment in Singapore were attributed to Mexican crisis, the Asian financial crisis, the global fund crisis, and high oil prices. In analysing the economic crisis in the Kurdistan region and its impact on foreign direct investment, Al-Mihya (2017) deduced the following: foreign direct investment inflow were adversely affected by the economic crisis; reduction in the

price of oil has a significant influence on the volume of foreign direct investment inflow in the country; volatility in the country currency also contributed to the reduction in investment inflow, and foreign investment took a smaller percentage of the total investment in the country. Ibrahim and Ahmed (2014) investigated the nexus between aggregate investment and oil price volatility for developed and developing countries using a generalised autoregressive conditional heteroskedasticity (GARCH) model to decompose conditional oil volatility into permanent oil volatility and transitory oil volatility. While adopting the vector auto-regressive method (VAR) to allow feedback effects between aggregate investment and its determinants, the study evidenced adverse effects of conditional oil volatility, permanent oil volatility, and transitory oil volatility on aggregate investment and real output. Interestingly, contrary to the findings for the developed markets (US and OECD), the real effects of permanent oil volatility tend to be stronger.

In Thailand, Rafiq, Salim, and Bloch (2009) employed a vector autoregressive (VAR) approach to investigate the impact of oil price volatility on economic activities using quarterly data between 1993Q1 and 2006Q4. They argued that a significant variation in the economic activities of the country was explained by oil price volatility.

In a study on the determinants of FDI in the economy of Kenya and Malaysia, Kinuthia and Murshed (2015) used the Vector autoregressive method (VAR) to analyse the data spanning 1960 to 2009. They observed that the determinants of FDI were more favourable in the economy of Malaysia compared with that of Kenya. They concluded that the success story of Malaysia compared with Kenya was differentiated by its macroeconomic stabilisation and trade policies, as well as, infrastructure and institutional factors. Cheng and Kwan (2000) also verified the determinants of FDI in 29 regions of the Chinese economy from 1985 to 1995 using the GMM estimation technique. They submitted that in the regions in China, a large regional market, good infrastructure, and preferential policy had a positive effect, but wage cost harmed FDI.

In Nigeria, Ademakinwa and Omokanmi (2017) noted that oil price has a significant positive influence on foreign direct investment (FDI) and economic growth, but expected to harm foreign direct investment and economic growth due to the attribute of uncertainty and destabilisation of effective fiscal management of crude oil revenue. From a different view, Olure et al. (2014) argued that in the long-run, world oil price exhibited a negative relationship with foreign direct investment in Nigeria. They further discovered that gross domestic product, degree of trade openness,

exchange rate, inflation rate, and world oil price justified the variations in Nigeria's foreign direct investment by 88 percent. Using the Ordinary Least Squares (OLS) estimation method, Udoh (2014) claimed that foreign direct investments have no significant relationship with oil export and the entire Nigerian economy due to misappropriation of funds and poor administration.

It is well established in the literature that the focus, scope, and methodology used in the study is the main reason for the unanimous conclusion on the issue of oil price and foreign investment nexus. Of important note is that no study has accounted for structural breaks and also examined the periodical effect of oil price on FDI by decomposing oil price. This study, therefore, fills this gap by examining the asymmetry effect of oil price on foreign direct investment in Nigeria using NARDL and also accounted for structural breaks.

### 3.0 Data Source and Methodology

The data used in this study is secondary in nature and spans from 1970 to 2018, sourced from the World Development Indicators (WDI) (2019) and BP Statistics (2019). The data include, Foreign direct investment net inflow (% of GDP) proxy for foreign direct investment (FDI), Ratio of the sum of import and export service to GDP at current LCU sourced from WDI proxy for trade (T), GDP per capita (Current LCU) proxy for gross domestic product (GDP), and official exchange rate (LCU, per US\$, period average) proxy for exchange rate. Oil price (\$US per barrel) sourced from BP Statistics (2019) proxy as oil price (OP). This study followed the model of Chow (1967), Cheng and Kwan (2000) and Kinuthia and Murshed (2015) which considered the determinants of FDI. The model for this study is specified as:  $FDI_t = f(OP_t, GDP_t, TR_t, EXR_t) \dots \dots (i)$

Equation (i) represents the relationship between oil price and foreign direct investment in Nigeria.

FDI is foreign direct investment, OP is oil price, GDP is gross domestic product per capita, TR is trade, EXR is official exchange rate of a naira to dollar, all at time t. Transforming equation (i) into log-nonlinear function, by decomposing oil price to capture the periodical changes;  $OP_t^+$  (positive periods) and  $OP_t^-$  (negative periods). Equation (ii) is specified as:

$$FDI_t = \beta_0 + \beta_1 \ln OP_t^+ + \beta_2 \ln OP_t^- + \beta_3 \ln GDP_t + \beta_4 TR_t + \beta_5 \ln EXR_t + \varepsilon_t \dots \dots \dots (ii)$$

In order to account for the long-run and short-run dynamics between oil price fluctuations and foreign direct investment in Nigeria, the NARDL model without breaks is specified as:

$$\Delta FDI_t = \vartheta_0 + \sum_{q=1}^n \rho_1 \Delta FDI_{t-k} + \sum_{q=1}^n \rho_2 \ln OP_t^+ + \rho_3 \ln OP_t^- + \sum_{q=1}^n \rho_4 \ln GDP_{t-k} + \sum_{q=1}^n \rho_5 \Delta TR_{t-k} + \sum_{q=1}^n \rho_6 \Delta EXR_{t-k} + \beta_1 FDI_{t-1} + \beta_2 \ln OP_t^+ + \beta_3 \ln OP_t^- + \beta_4 \ln GDP_t + \beta_5 \ln EXR_t + \delta ec m_{t-1} \dots \dots \dots (iii)$$

From equation 3, the NARDL with breaks model where the breaks are considered as fixed regressors is specified as:

$$\Delta FDI_t = \vartheta_0 + \sum_{q=1}^n \rho_1 \Delta FDI_{t-k} + \sum_{q=1}^n \rho_2 \Delta \ln OP_t^+ + \rho_3 \ln OP_t^- + \sum_{q=1}^n \rho_4 \ln GDP_{t-k} + \sum_{q=1}^n \rho_5 \Delta TR_{t-k} + \sum_{q=1}^n \rho_6 \Delta EXR_{t-k} + \beta_1 FDI_{t-1} + \beta_2 \ln OP_t^+ + \beta_3 \ln OP_t^- + \beta_4 \ln GDP_t + \beta_5 TR_t + \beta_6 \ln EXR_t + \delta ec m_{t-1} + \sum_{r=1}^s B_r Dummy_{rt} + \varepsilon_t \dots \dots \dots (iv)$$

From equation (iii and iv),  $\Delta$  denotes changes in the variables in the short-run,  $n$  is the optimal lag length,  $\varepsilon_t$  - error term at time. The parameters  $\rho$  ( $i = 1, 2, 3, 4, 5, 6$ ) are the corresponding long-run multiplier, and the parameters  $\beta = (1, 2, 3, 4, 5, 6)$  are the short-run dynamic of the NARDL model.  $\delta ec m$  is the parameter estimate of the error correction model.  $Dummy_{rt}$  is a dummy variable for each of the break defined as  $Dummy_{rt} = 1$  for  $t > T_B$  otherwise,  $Dummy_{rt} = 0$ .  $t$  represents the time period;  $T_B$  are the structural break dates where  $r = 1, 2, 3, \dots, k$  and  $B_r$  is the coefficient of the breaks dummy.

### 4.0 Empirical Results

#### 4.1 Descriptive Statistics

From the analysis, it was observed that the behaviour of the variables were well behaved within the time period under study. The mean values lie in between their minimum and maximum levels. The implication of this is that their reactions to unexpected shocks in the economy was not outrageous and was within expectation. Therefore, on average, FDI, OP, GDP EXR and TR averagely changed by 2.61 units, 1.37 percent, 3.88 percent, 54.5 units, and 36643.91 units within the period under study. The skewness result showed that oil price (OP) was negatively skewed, showing its uniqueness behaviour among other variables as FDI, GDP, EXR and TR had a long tail to the right. Following the Jarque-Bera outcome, it was also noted that the oil price and GDP were normally distributed, while FDI, EXR and TR were not bell shaped (i.e. not normally distributed). This was justified by the probability values which were expected to be greater than 10 percent in order to be normally distributed and shows the necessity to rely on asymmetric methods, as adopted by the study (see table 1).

**Table 1: Descriptive Statistics**

	FDI	lnOP	lnGDP	EXR	TR
Mean	2.607264	1.373995	3.879470	54.50505	36643.91
Maximum	10.83256	2.047935	5.717982	192.4405	206517.1
Minimum	-1.150856	0.255273	2.203171	0.546781	31.40865
Std. Dev.	2.170242	0.423768	1.154692	65.15405	57256.71
Skewness	1.781939	-0.676816	0.157175	0.667911	1.594895
Kurtosis	7.088366	3.730236	1.592043	1.711897	4.383620
Jarque-Bera	56.38061	4.533998	3.988889	6.600289	23.17089
Probability	0.000000	0.103623	0.136089	0.036878	0.000009
Observations	49	49	49	49	49

Compiled by Authors (2020)



From the correlation test, it was revealed that oil price and trade have a negative and inelastic correlation with foreign direct investment, while GDP and EXR were positively correlated, but insignificantly correlated with FDI in Nigeria within the period under study. The implication of this result is that changes in oil price and

**Table 2: Correlation Result**

Variables	FDI	InOP	InGDP	EXR	TR
FDI	1				
	-----				
InOP	-0.077266 (0.6098)	1			
		-----			
InGDP	0.209575 (0.1622)	0.767996 (0.0000)*	1		
			-----		
			0.92140		
EXR	0.032669 (0.8294)	0.701665 (0.0000)*	4 (0.0000)	1	
			*	-----	
			0.82339		
TR	-0.065497 (0.6654)	0.726553 (0.0000)*	2 (0.0000)	0.864479 (0.0000)*	1
			*	-----	

Note: \*, \*\*, \*\*\* implies the level of signification at 10%, 5% and 1% respectively

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To test if the variables are free of unit root problem and are mean reverting in the long-run, the Ng-Perron test was employed. It was revealed from the result that the variables were stationary at I(0) and I(1). This implies that there is problem of unit root among the variables as all the variables were not stationary at I(0) (see table 3 for the result). This therefore necessitated the need to test if the variables have a long-run relationship using ARDL bounds test. Also, an

innovation in this study is the adoption of Bai-Perron (2003) structural break test which is capable of accounting up to five possible breaks. The study adopted this method to minimise the possibilities of having a spurious conclusion.

**Table 3: Unit Root Test**

Variables	Levels			
	MZa	MZt	MSB	MPT
	-	-		
FDI	16.6078***	2.83038***	0.17043***	5.79361***
InOP	-4.80563	-1.47296	0.30651	18.4985
InGDP	-4.3592	-1.47468	0.33829	20.8889
EXR	-2.9118	-1.04304	0.35821	26.9705
TR	-4.4924	-1.49712	0.33326	20.2712
First Difference				
$\Delta FDI$	-19.4381*	-3.11698*	0.16035*	4.69136*
$\Delta InOP$	-21.9279**	-3.2216**	0.14692**	4.69064**
$\Delta InGDP$	-21.9261**	-3.28305**	0.14973**	4.32481**
$\Delta EXR$	-21.967**	-3.20675**	0.14598**	4.78769**
$\Delta TR$	-20.8188**	-2.96824**	0.14258**	5.88249**

Note: \*, \*\*, \*\*\* implies the level of signification at 10%, 5% and 1% respectively.

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To examine the long-run relationship among the variables, the study took into consideration the decomposition of oil price into negative and positive periods. While analysing without breaks, the NARDL bounds test result was inconclusive as its F-statistic value falls between the lower and upper bounds class. This implies that probability of long-run relationship is ambiguous (see table 4).

**Table 4: NARDL Bounds Test**

Energy and FDI Model		
Model Estimation	F-statistic	Lower & Upper
Class bound @ 10%		
$F_{FDI}(FDI_t/InOP_t/InGDP_t/TR_t/EXR)$	3.11	2.75-3.79

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The structural break test showed two periods of breaks: 1989 and 1995. The study accounted for the breaks in the NARDL model as dummies which was treated as a fixed regressors. The result of the structural break is reported in table 5.

**Table 5: Bai - Perron Test**

Country	Break Period	Break Range
Nigeria	1989	1970 - 1988
	1995	1989 - 1994
		1995 - 2015

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### NARDL Estimate

The NARDL estimate showed that accounting for breaks (specifically 1989) is significant in the model. This implies that the model behaves better when structural breaks were accounted for. The estimate also revealed that positive changes in oil price have a negative and insignificant relationship with foreign direct investment in Nigeria. At the same time, negative changes in oil price have a negative impact on FDI in the short-run and long-run considering breaks, while without breaks, negative changes in oil price have a positive and inelastic impact on foreign direct investment. The implication of this is that in the long-run, with and without breaks, more positive changes in oil price reduce FDI by 1.9 percent and 1.6 percent, respectively, in the long-run, while in the short-run, reduces FDI by 1.3 percent with and without breaks. More negative changes in oil price increase FDI by 4.2 percent and 2.8 percent in the short-run and long-run, respectively, without breaks. When breaks were accounted for, more negative changes will reduce FDI by 0.29 percent and 0.23 percent in the long-run and short-run, respectively. The result partly deviates from Quero-Virla (2016) study for Colombia and Ademakinwa and Omokanmi (2017) for Nigeria, but inconsistent with the findings of Sharifi-Renania and Mirfatah (2012) in Iran and Olure et al. (2014) in Nigeria, that oil price negatively impacts on FDI in Nigeria. Exchange rate and trade also in the long-run and short-run have a negative and inelastic impact on foreign direct investment in Nigeria. It was therefore observed that the magnitude, even though negative, is weak as it is not up to 1 percent both in the short-run and long-run. The findings are against the findings of Kinuthia and Murshed (2015) in Kenya and Malaysia that trade policies have not been favoring the economy of Nigeria. GDP in the long-run and short-run positively and significantly influences foreign direct investment in Nigeria. The implication of this is that as GDP increases by one percent, in the long run, FDI increases by 1.3 percent and 3.8 percent, while in the short-run, by 0.85 percent and 3 percent without and with breaks, respectively. This negates the submission of Elheddad (2016), which states a negative nexus between GDP and FDI. The error correction model for both models is rightly signed and significant. This implies that without breaks, 65 percent

of FDI deviations from the short-run equilibrium are corrected in the long-run by the independent variables while considering breaks, 79 percent is corrected. This implies that considering the structural breaks in the model makes the model more significant and explains the phenomenon better.

The reliability test considering breaks showed that the model is stable and explains the phenomenon, which is also justified by the F-stat value. The model is free of serial correlation problem but has heteroskedasticity problem, which may be due to the inclusion of fixed regressors as the NARDL model without breaks is free of heteroskedasticity problem.

**Table 6: NARDL Estimation Result**

Variables	NARDL Without Breaks	NARDL With Breaks
	<b>Long-Run Results</b>	
$InOP_t^+$	-1.9345 (0.6907)	-1.600 (0.6493)
$InOP_t^-$	4.2280 (0.5808)	-0.2970 (0.9576)
EXR	-0.0176 (0.4079)	-0.002 (0.9153)
TR	-0.000023 (0.1427)	-0.000017 (0.3179)
$InGDP$	1.3023 (0.7333)	3.7965 (0.4232)
B1		4.2603 (0.0345)**
B2		0.3910 (0.9135)
<b>Short-run Results</b>		
$InOP_t^+$	-1.2610 (0.6871)	-1.2669 (0.6462)
$\Delta InOP_t^-$	2.7560 (0.5765)	-0.2351 (0.9576)
$\Delta EXR$	-0.011 (0.4405)	-0.0014 (0.9159)
$\Delta TR$	-0.000015 (0.1526)	-0.000013 (0.3108)
$\Delta InGDP$	0.8489 (0.7422)	3.0059 (3.6082)
B1		3.3731 (0.0417)**
B2		0.3096 (0.9139)
$ECM_{t-1}$	-0.6518 (0.0005)*	-0.7918 (0.0000)*
F-Stat	4.9975	4.4247*
Bounds F-Stat	3.1132	5.6110***
Adj. R2	0.4877	0.4119
J.B. Stat	2.306087 [0.3157]	2.894439 0.235223
LM(1)	0.4544 [0.6385]	0.7860 [0.4640]
Breusch-Pagan test	1.7759 [0.1217]	13.6696 [0.0000]*
Ramsey test	1.3828 [0.2642]	2.4947 [0.10]
SIC lag selection	(1,0,0,0,0)	(1,0,0,0,0)

B represents dummy for the identified break date as identified in the Bai Perron test presented in Table 6. T-statistics are presented in brackets and probability values are presented in parentheses. The critical values for the Lower and Upper Bounds are 3.03 and 4.06 respectively for the symmetric models at 10 percent significance level. \*, \*\*, and \*\*\* indicate statistical significance at 1 percent, 5 percent and 10 percent, respectively.

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## 5.0 Conclusion and Recommendation

The study investigates the link between oil price and foreign direct investment in Nigeria between 1970 and 2018. The non-Linear Autoregressive Distributed Lag method was used to estimate the parameters. Bai-Perron's (2003) test was used to account for the structural breaks. It was noted from the structural

break result that there are two break periods within the period under study. The break periods are 1989 and 1995, but 1989 is significant when included in the model as a fixed regressor. From the NARDL estimation, considering breaks, oil price negatively influenced FDI in Nigeria in the short-run and long-run. The error correction model was rightly signed and was significant at 5 percent, and it corrected about 79 percent of deviations of FDI in the short-run back to equilibrium in the long-run. The study concludes from the findings that oil price fluctuations are detrimental to FDI in Nigeria irrespective of positive or negative changes. From the findings, the study recommended that adequate measures should be taken by considering the investment in other sectors of the economy to attract investors and create an atmosphere whereby they are not affected by the oil price.

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The essence of this guideline is to help focus on areas we want covered. Note, this is not exhaustive. Please feel free to address all other issues you consider pertinent to the mandate of the Central Bank of Nigeria.

2. The article **should not be more than twenty-five (25) pages of 4000 – 7000 words in length**. It should be typed with 1.15 line spacing option, with a margin of 1.25 and 1.13 inches on the left and right sides, respectively. The font type to be used is **“Arial”** with font **size “14” for headings** and **size “12” for the body** of the article.

3. The manuscript must be accompanied with a letter of submission written in English. Submission of a paper is assumed to imply that its contents represent original and unpublished work and is not under consideration elsewhere for publication.

4. There is neither a submission charge nor page fee. The complete names and address (postal and email) of the author or lead author in the case of co-authored papers should be clearly indicated. **Please note that papers with more than two co-authors will not be accepted.**

5. Papers may be rejected, accepted or returned for specified revisions.

6. All submitted manuscripts are referred to an Editorial Board comprising of an in-house editorial committee and external referees for peer-review of the paper. All comments by the referees will be sent to the author(s), including a decision of the Editorial Board to publish or not to publish the paper.

7. The purpose and scope of the article should be clearly stated in an abstract summarising the article's essential findings. The abstract should be typed on a separate page and should be **italicised and not more than 100 words in length**. In addition, the JEL classification code (s) as well as keywords should be clearly indicated on the abstract page.

8. The author's institutional affiliation and necessary background information on the article should appear at the foot of the first page. Footnote to the text should be listed at the end, followed by the list of references

9. The honorarium for authors of accepted papers in the Bullion is ₦80,000 per paper and for reviewers ₦30,000 per paper.

10. References for quotations or statements should be in parentheses in the text, not as notes. e.g. Mordi (2010:20) or Mu'azu (2014). Where more than two authors are involved, cite senior author and use et al., for example, Johnson et al. (1988).

11. Citations listed under the reference sections must begin on a new page. All entries must be typed double-spaced, listed alphabetically by last name of senior author and chronologically for two or more articles by the same author. The typed layout must conform to the Havard style, as follows:

Mordi, C. N. O. (2010). "The Nigerian Financial Crisis: Lessons, Prospects and Way Forward", CBN Bullion. Vol. 31 No. 3, July – September, pp. 1-10.

Adenuga, A. O. and O. Evbuomwan (2011). "Understanding the Bretton Woods Institutions (BWIs) with Particular Reference to the International Monetary Fund (IMF)" CBN Bullion. Vol. 35 No. 4, October – December, pp. 10-15.

12. All tabular materials should be separated from the text in a series of tables numbered consecutively in Arabic numerals preferably in Microsoft Excel. Each table should be typed double-spaced and identified by a short title at the top. Notes for table should be at the bottom of each table, before the source, and marked by lower case superscript letters. Appropriately placed tables should be indicated in the text.

13. Diagrams, graphs, charts, etc. must be separated from the text and clearly plotted on a white paper with all axes clearly positioned. They should be inserted appropriately in the text.

14. Where mathematical equations and formulae are used, they should be typed clearly, using MathType or Microsoft Equation Editor. The equations should be numbered consecutively in Arabic numerals.

15. All submissions should be accompanied with a clear digital soft copy passport size photographs of the author(s).

Your passport photo must be:

- clear and in focus
- in colour
- unaltered by computer software
- at least 600 pixels wide and 750 pixels tall
- at least 50KB and no more than 10MB
- contain no other objects or people
- be taken against a plain light-colored background
- be in clear contrast to the background
- not have 'red eye'

In your photo you must:

- be facing forwards and looking straight at the camera
- have a plain expression and your mouth closed
- have your eyes open and visible
- not have anything covering your face
- not have any shadows on your face or behind you

Do not wear sunglasses or tinted glasses. You can wear other glasses if you need to, but your eyes must be visible without any glare or reflection.

Digital Passport photos is a mandatory requirement to be published

Thank you.

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**Central Bank of Nigeria**