Financial Inclusion, Capital Accumulation and Agricultural Output Growth in Nigeria: Evidence from 1993-2024

F. N. Okoro*, R. O. Mejaha, and M. E. Njoku

Department of Agricultural Economics, Michael Okpara University of Agriculture Umudike, Umuahia, Abia State, Nigeria.
Corresponding Author Email: franknnaokoro@gmail.com

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ABSTRACT

This study examines long-term trends in financial inclusion and their implications for capital accumulation and agricultural output growth in Nigeria from 1993 to 2024. Using national indicators of demand-side and supply-side financial inclusion, alongside agricultural GDP and gross fixed capital formation, the analysis documents a structural transformation of Nigeria's financial system from widespread exclusion to digitally driven inclusion. Financial inclusion expanded rapidly after 2012, driven by fintech adoption, agent banking, and regulatory reforms, with the share of formally included adults rising from below 25% to over 65%, and financial exclusion declining sharply. Supply-side infrastructure particularly POS terminals and agent networks grew exponentially, indicating a shift from physical banking to digital delivery channels. A composite Financial Inclusion Index increased steadily from 0.22 in 2012 to 0.76 in 2023, confirming broad-based access expansion. Agricultural GDP and capital accumulation exhibited sustained upward trends, particularly after the mid-2000s, coinciding with financial sector reforms and targeted agricultural finance interventions. However, private sector credit growth lagged behind access expansion, revealing a persistent gap between financial inclusion breadth and credit depth. Despite rising account ownership and transaction access, agriculture continued to receive a disproportionately small share of formal credit, limiting the translation of inclusion gains into productive investment. The findings indicate that Nigeria's financial inclusion progress has been largely transactional rather than investment-oriented. Policy efforts should therefore shift from access expansion toward credit deepening by strengthening agricultural finance, linking digital financial services to productive investment, improving risk-sharing mechanisms, and promoting long-term capital formation to support sustained agricultural output growth and inclusive economic development.

Keyword: *Financial Inclusion; Capital Accumulation; Agricultural Output Growth; Gross Fixed Capital Formation; Nigeria*

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INTRODUCTION

Agriculture has been the backbone of Nigeria's economy, long before the discovery and exploitation of crude oil. The sector remains central to livelihood sustenance, food security, and employment generation, particularly in rural areas, and encompasses activities such as crop cultivation, livestock production, fisheries, poultry, and forestry (Ojo *et al*., 2022). Beyond food provision, agriculture supplies raw materials to agro-based industries, contributes to poverty reduction, and supports economic diversification (Gomina *et al*., 2024; NALTF, 2025). Despite its importance, Nigeria's agricultural sector continues to face significant structural and institutional constraints. One of the most critical challenges is limited access to formal financial services, which restricts farmers' ability to adopt productivity-enhancing technologies and innovations. Smallholder farmers, especially those in remote rural areas, often lack access to affordable credit, savings instruments, and insurance services required for capital accumulation and farm expansion (Ashoro *et al*., 2024). These challenges are further compounded by infrastructural deficiencies, poor market linkages, and high transaction costs.

Financial inclusion has therefore emerged as a key policy priority for unlocking agricultural productivity and output growth. Financial inclusion refers to the ability of individuals and businesses to access and effectively use appropriate financial products and services, including credit, savings, insurance, and payment systems (El-Said *et al*., 2020; Oladimeji & Adegbite, 2019). Access to these services enhances investment capacity, improves risk management, and strengthens resilience across the agricultural value chain.

In Nigeria, however, the financial inclusion landscape has historically been shaped by long distances to financial service points, low financial literacy, high banking costs, and widespread distrust of formal institutions (EFInA, 2024). To address these challenges, the Federal Government introduced several financial-sector reforms, most notably the National Financial Inclusion Strategy (NFIS) in 2012. The NFIS aimed to reduce financial exclusion from 46.3% in 2010 to 20% by 2020 through agent banking, mobile money expansion, simplified KYC procedures, and low-cost financial products (CBN, 2024). Complementary institutional reforms were also implemented to support agricultural finance. The Bank of Agriculture (BOA) and the Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL) were repositioned to de-risk agricultural lending and encourage increased credit flow to the sector (NIRSAL, 2025). Similarly, the Anchor Borrowers' Programme (ABP), launched in 2015, linked smallholder farmers to anchor firms, provided input financing, and guaranteed offtake arrangements, resulting in improved productivity and higher capital investment among beneficiaries (Osabohien *et al*., 2023).

Between 1993 and 2024, Nigeria experienced notable changes in financial sector structure, regulatory frameworks, and digital financial service delivery. Innovations such as mobile banking, USSD platforms, fintech lending, and microfinance expansion significantly altered access to financial services, particularly in rural areas (Ojo *et al*., 2022). These developments have important implications for capital accumulation, defined as the mobilization of financial and physical resources for productive investment in agriculture (Umaru & Inusa, 2022).

At the macroeconomic level, deeper financial intermediation has been associated with improved investment efficiency, poverty reduction, and economic transformation in sub-Saharan Africa (Uzoma, Akintola, Folashade, & Areghan, 2024; Diallo, 2024). However, Nigeria still accounts for about 4% of the world's unbanked adult population, highlighting the persistence of financial exclusion (Demirgüç-Kunt *et al*., 2022). Given the centrality of agriculture to Nigeria's economy, understanding the evolution of financial inclusion indicators and their relationship with capital accumulation and agricultural output growth is essential for effective policy design. This study therefore analyzes financial inclusion indicators in Nigeria from 1993 to 2024.

Financial inclusion and capital accumulation are widely recognized as critical drivers of agricultural productivity and economic development, particularly in developing economies such as Nigeria (Babajide, 2020; Demirgüç-Kunt *et al*., 2018). As Nigeria seeks to diversify its economy away from oil dependence, agriculture remains a viable pathway for employment generation, food security, and inclusive growth. However, persistent financial exclusion continues to undermine the sector's productive potential.

Empirical evidence indicates that a large proportion of Nigeria's rural population remains excluded from formal financial systems. According to EFInA (2020), about 38.6% of Nigerians—approximately 75.6 million people lack access to formal financial services, with rural communities disproportionately affected. This rural–urban divide in financial access has been widely documented (Uduji & Okolo-Obasi, 2023; CBN, 2023). For farmers, this exclusion limits access to credit, savings, insurance, and payment services, thereby constraining capital accumulation and agricultural output growth.

Limited access to formal credit forces many smallholder farmers to rely on informal lenders who charge exorbitant interest rates, eroding farm income and discouraging reinvestment (Oyelade, 2019; Effiom & Etim, 2020). This reliance on informal finance reduces the likelihood of adopting improved agricultural technologies and contributes to stagnation in productivity, persistent food insecurity, and increased reliance on food imports (Umaru & Inusa, 2022).

Furthermore, Nigeria's agricultural sector remains chronically underfunded by formal financial institutions. The sector has consistently received a disproportionately low share of commercial bank loans, averaging below 6% over several decades (CBN, 2022). This trend persists despite agriculture's role as the largest employer of labour and a key contributor to national food supply. Low financial literacy among rural farmers further exacerbates exclusion, with over 60% lacking adequate knowledge to engage effectively with formal financial systems (Adesanya & Olajide, 2021).

Consequently, financial exclusion reinforces socioeconomic disparities within the agricultural sector, where a small group of commercial farmers with access to finance achieves higher productivity, while the majority of smallholders remain trapped in low-capital, low-output cycles (Babajide, 2020). Addressing these challenges requires a clearer understanding of how financial inclusion indicators have evolved over time and how they interact with capital accumulation to influence agricultural output growth in Nigeria.

Although a substantial body of literature links financial inclusion to agricultural development, existing studies are largely fragmented, focusing either on micro-level outcomes or on isolated financial instruments such as credit access and microfinance (Babajide, 2020; Effiom & Etim, 2020; Sethy & Goyari, 2023). Most empirical works examine firm-level, household-level, or value chain–specific effects, offering limited insight into how financial inclusion operates across the agricultural sector as a whole.

Moreover, critical structural constraints, such as persistent underfunding of agriculture by formal financial institutions (CBN, 2022), low levels of financial literacy among rural populations (ACCA & FATE Foundation, 2020), and widespread reliance on informal lending systems (Ojo & Adebayo, 2020; ACCA, 2023), are rarely integrated into a unified analytical framework that captures their combined effects on capital accumulation and agricultural output growth. Despite more than three decades of financial sector reforms and targeted agricultural finance interventions, rural financial inclusion in Nigeria remains below 35% (World Bank, 2022), while agriculture continues to receive a disproportionately small share of formal credit. Yet, the long-term implications of these persistent constraints for agricultural output growth have not been adequately examined using macro-level time-series data.

Consequently, there remains a clear gap in longitudinal, economy-wide evidence linking financial inclusion, capital accumulation, and agricultural output growth in Nigeria, which this study addresses using national data spanning 1993–2024.

In order to address these gaps, the study considered the following specific objectives;

i Identify and analyze financial inclusion indicators in Nigeria (1993-2024);

ii Examine the trends of financial inclusion, agricultural GDP (AGDP) and capital accumulation (CAP) used as proxy for gross fixed capital formation in Nigeria (GFCF).

MATERIAL AND METHODS

The study was conducted in Nigeria. Nigeria is a country located in West Africa, between latitudes 4° and 14° N, and longitudes 3° and 15° E. It covers a total land area of approximately 923,768 square kilometers, a North-South length of about 1450 km and West-East breath of about 800 km. Its total boundary is 4047 km, while the coastline is 853 km and a population estimate of over 200 million people making it the most populous country in Africa (NPC, 2021). It shares borders with Benin to the west, Chad and Cameroon to the east, and Niger to the north. Its southern coastline is along the Gulf of Guinea in the Atlantic Ocean. It comprises 36 states and the Federal Capital Territory is located in Abuja. Nigeria is located in the tropics, which is characterized by high temperatures, high humidity and intense heat. Its rainfall ranges between 2000 and 3000 mm. Nigeria encompasses (6) major agro-ecological zones (Onyeiwu *et al.,* 2021).

Nigeria, often referred to as the "Giant of Africa," has a vast land area of 923,768 km² and an estimated population exceeding 200 million (Onyeiwu et al, 2021). As an agrarian nation with extensive arable land, the country is well-positioned to harness its agricultural potential for economic transformation. The data for the study are basically time series data (secondary data) covering 1993 to 2024 years.

The choice of this period was to determine the effort of Nigerian policies in driving financial inclusion and capital accumulation of farmers in the country. The data were collected from Central Bank of Nigeria (CBN) Statistical Bulletin, National Bureau of Statistics (NBS), National Financial Inclusion Revised Strategy and Federal Ministry of Agriculture annual issues. Data were also obtained from other multiple credible sources, including the IMF Financial Access Survey (FAS), the World Bank Global Findex Database and the EFInA Access to Financial Services in Nigeria (A2F) Survey.

The data included aggregate agricultural output, capital accumulation proxied by Gross Fixed Capital Formation and Human Capital Formation. Financial inclusion indicators included: Demand-side financial inclusion: (the banked, the formally included, the informal only, the financially included and the number adult Nigerians with account ownership) and the Supply-side financial inclusion: bank branch per 100,000 persons, ATMS per 100, 000 persons, number of POS terminals number of registered agents, private credit/GDP and deposit accounts (CBN, 2024).

The data collected for the study were analysed in line with the specific objectives of the study. Objectives I, II and III were realized using descriptive statistics tables and (graphs/charts).

RESULTS AND DISCUSSION

Statistics of financial inclusion, agricultural GDP (AGDP) and capital accumulation (CAP) used as proxy for gross fixed capital formation (GFCF) in Nigeria (1993–2024)

The summary descriptive statistics presented in the (Tables 1 – 3) show the central tendency, dispersion, and distributional characteristics of both demand- and supply-side financial inclusion indicators in Nigeria over the period 1993–2024. These measures include the mean, minimum and maximum values, standard deviation, skewness, kurtosis, and Jarque-Bera probability, which together describe how financial inclusion variables behaved across time. According to Gujarati & Porter (2009) and Wooldridge (2016), these descriptive measures are foundational in econometric analysis because they inform data normality, variability, and outlier influence before any formal regression analysis is performed. Financial inclusion in this work is of two sides: Demand and Supply-sides

Demand-Side of Financial Inclusion Indicators

The demand-side of financial inclusion is grouped into two viz: Enhancing Financial Innovation and Account ownership

Enhancing Financial Innovation and Access (EFInA Access-Strand Framework)

The Enhancing Financial Innovation and Access-Strand model (EFInA) is Nigeria's official framework for measuring financial inclusion progress. This model took effect from 2008. It classifies the adult population (18+) into four mutually exclusive groups (Enhancing Financial Innovation and Access, [EFInA], 2023). They include:
Banked: Adults with an account at a commercial or microfinance bank.
Formally Included: Adults using any regulated financial service (bank, MFI, mobile money, insurance, pensions).
Informal Only: Adults relying on informal services (e.g., esusu, ajo, savings groups).
Financially Excluded: Adults with no access to either formal or informal services.

This classification allows policymakers to monitor both depth (quality and formality of inclusion) and breadth (coverage and access). The summary statistics of EFInA is presented in (Table 1). Result in Table 1 shows that the mean percentage of adults with access to formal financial services increased progressively across EFInA rounds from roughly 24% in 2008 to 64% in 2023, while the mean for those excluded fell from about 53% to below 26%. This trend shows a consistent improvement in access, aligning with the CBN's National Financial Inclusion Strategy (NFIS) targets of 70% inclusion by 2025 (CBN, 2023). The mean share of banked adults increased significantly, with declining financial exclusion. The relatively moderate standard deviations indicate gradual, not erratic, changes in access to financial services across years. It also indicate steady improvement rather than sharp fluctuations. This suggests policy continuity and institutional efforts (EFInA, 2023; World Bank, 2021). Positive skewness in the "formally included" category implies a concentration of lower inclusion levels in earlier years with a long tail of higher values later; typical of an accelerating growth pattern. Kurtosis values close to 3 suggest a near-normal distribution, which supports the assumption of data stability over time. The Jarque–Bera statistics generally show p-values above 0.05, indicating that the data are approximately normally distributed, hence suitable for time-series econometric analysis. This supports the use of models like ARDL or VAR, which assume approximately normal residuals (Brooks, 2014). It is worthy of note that the Enhancing Financial Innovation & Access (EFInA) "Demand-side Summary Statistics began in 2008**.** It was the year when EFInA first carried out its full national survey of financial access among Nigerian adults. It also reflects the period when reliable, representative, nationwide demand-side data for Nigeria's adult population was available, such that EFInA (and its funders/partners) could undertake a sustained, periodic measurement of financial inclusion.

Figure 1 shows the trend in the selected financial inclusion (EFInA demand-side) indicators for eight rounds (survey years). Result in (Figure 1) shows that the banked population (the banked) rose sharply from 21% in 2008 to 51% in 2023, showing consistent upward movement. The formally included population (including mobile money and microfinance users) increased from 23% in 2008 to 65% by 2023. The trend for 'informal only' users declined steadily from 25% to 9.8%, while the financially excluded group dropped drastically from 54% to 27%. The upward trajectory of both "Banked" and "Formally Included" strands demonstrates Nigeria's deepening formal financial system. This development aligns with key policy interventions and technological innovations, notably the National Financial Inclusion Strategy (NFIS) launched by the Central Bank of Nigeria in 2012 and subsequently revised in 2018 and 2023, which targets a reduction in financial exclusion to 20% by 2025 (CBN, 2023). The introduction of the Bank Verification Number (BVN) system in 2014 and the issuance of agent banking guidelines significantly lowered customer onboarding barriers. In addition, the rapid expansion of fintech firms and mobile money platforms such as OPay, Paga, and Moniepoint contributed substantially to inclusion gains, particularly after 2018. Consistent with global evidence, Demirgüç-Kunt et al. (2018) show that digital financial innovations account for over half of new account ownership in developing economies since 2014. Nigeria's post-2018 inclusion trajectory therefore reflects the broader pattern of

Table 1: EFInA Demand-side Summary Statistics (2008–2023).

Indicator (	Obs.	Mean	Min	Max	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.
Banked (%)	8	36.86	21.1	51.0	9.24	-0.2169	3.2182	0.1459	0.9296
Formally included (%)	8	45.59	23.6	64.0	12.48	-0.3997	3.33	0.2234	0.8943
Informal only (%)	8	14.54	9.8	25.0	4.69	1.246	4.1515	1.3353	0.5129
Excluded (%)	8	39.33	26.7	52.5	8.14	-0.0471	3.3205	0.09	0.956

Source: EFInA Data, 2023

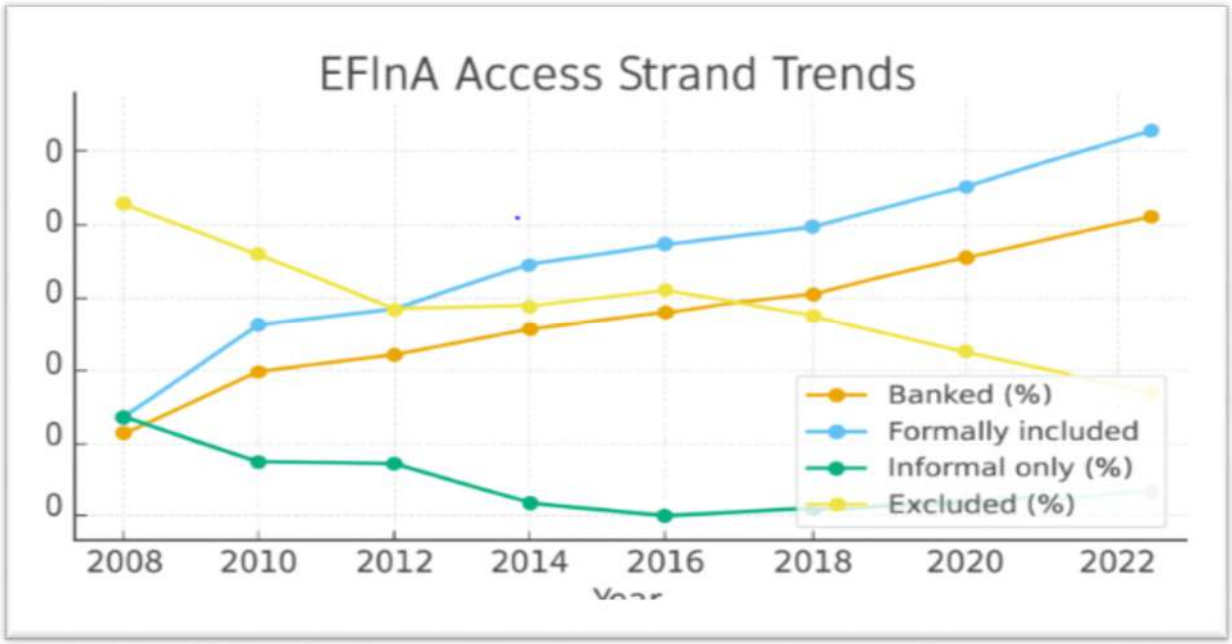

Figure 1: Financial Inclusion in Nigeria (EFInA access strand, 2008 – 2023) Source: Author's

"digital-led financial inclusion" documented in the World Bank Global Findex (2021). Notably, recent account ownership figures for 2024 are estimates, based on observed trends rather than finalized survey data, and should be interpreted accordingly.

Account Ownership

The actual Global Findex account ownership data in Nigeria (2011-2024) summary descriptive statistics are presented in (Table 2). The World Bank's Global Findex Database provides cross-country comparable data on account ownership from 2011, which is used as the baseline for this analysis. Table 2 shows account ownership among Nigerian adults: 30% in 2011, 44% in 2014, 39% in 2017, 45% in 2021, and an estimated 55% in 2024 (projected). Over the period, the mean account ownership was 42.6%, with a minimum of 30.0% and a maximum of 55.0%, reflecting moderate variability (SD = 9.13). Skewness (0.068) is slightly positive, indicating higher values in later years and a right-tailed distribution, while kurtosis (3.84) suggests a leptokurtic distribution. The Jarque–Bera test (JB = 0.132, p = 0.9361) indicates that the series does not significantly deviate from normality, supporting its suitability for time-series econometric analysis. The trend highlights gradual but sustained improvements in account ownership, consistent with financial inclusion initiatives and the growing adoption of digital financial services in Nigeria. Trend in account ownership by adult of 18 years and above is presented in (Figure 2). Figure 2 shows a rise in account ownership from 30% in 2011 to 55% in 2024 (projected), a gain of 25 percentage points. The period was divided into three phases: (i) an initial expansion 2011–2014, coinciding with the early National Financial Inclusion Strategy (NFIS) implementation and initial mobile-money and agent-bank expansions (CBN, 2024); (ii) shows decline, 2014–2017 associated with macroeconomic shocks and operational constraints in the banking sector; and (iii) a recovery and acceleration phase from 2017 onwards. The acceleration phase resulted for the following reasons: fintech proliferation, agent growth, BVN rollouts, and payment systems improvements (CBN, 2024; EFInA A2F, 2024). The observed increase in account ownership is consistent with global and regional evidence that digital financial services and agent networks are primary drivers of account proliferation (Demirgüç-Kunt *et al.*, 2024). The dip in 2017 could be explained by macroeconomic and institutional constraints as highlighted in Nigeria's economic history (World Bank, 2018).

The recovery and acceleration after 2017 align with EFInA's findings that agent banking, regulatory reforms,

Table 2: Summary Statistics of Account ownership in Nigeria (2011-2024).

Observations	Mean	Min	Max	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
5	42.6	30.0	55.0	9.13	0.0679	3.8364	0.132	0.9361

Source: Computed from CBN Data

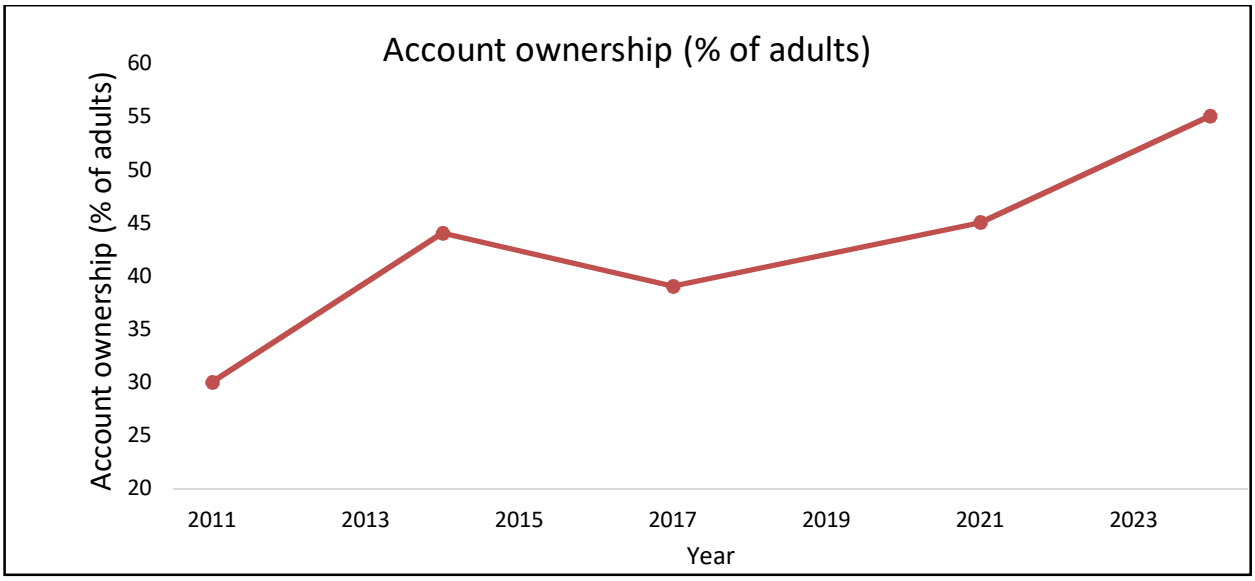

Figure 2: Trend in account ownership by adult of 18 years and above

and mobile fintechs expanded access especially among the previously excluded (EFInA, 2023).

Supply-Side of Financial Inclusion

The summary statistics and trend of supply-side of financial inclusion are presented in (Table 3 and Figures 3, 4, 5 and 6). Table 3 shows the indicators of supply-side of financial inclusion (1993-2024). The mean number of bank branches per 100,000 adults rose steadily, while ATMs and POS terminals increased exponentially with POS terminals growing from fewer than 1,000 in the early 2000s to over 2.9 million in 2024. High standard deviations in POS terminals and agent numbers (relative to their means) reflect rapid diffusion of new technologies common when innovation penetrates previously unbanked regions (EFInA, 2023; Ozili, 2021). The supply-side variables (especially POS and ATMs) exhibit strong positive skewness, indicating that lower values dominated earlier years, followed by a long tail of very high values as inclusion expanded. This mirrors exponential diffusion patterns described by Rogers (2003) in his Diffusion of Innovations theory. Kurtosis above three (3) for some indicators implies leptokurtic distributions more peaked than normal suggesting that a few years experienced unusually high expansion (e.g., 2016–2020). The expansion could be explained by the adoption of POS. The JB test results for most supply-side indicators as listed in Table 3 also fall within acceptable limits ($p > 0.05$), implying approximate normality. This makes the series appropriate for further parametric statistical analysis and reinforces that growth patterns are systematic, not random.

Overall, both demand and supply-side indicators show: Strong upward mean trends, decreasing variability (Std. Dev.), indicating convergence, and Positive skewness, typical of expanding markets. This reflects a transition from shallow financial access in the 1990s to deep, technology-driven inclusion by the 2020s. These findings are consistent with: Financial inclusion continues to evolve in tandem with institutional frameworks and technological innovation. Recent studies highlight that fintech and digital infrastructure are central to this progression, with evidence showing that institutional and technological development strongly shapes financial inclusion outcomes (Dao, Le & Nguyen, 2025; Tidjani & Madouri, 2024). Similarly, digital financial services have been shown to significantly expand access in developing economies, with IMF research demonstrating that DFS adoption improves both usage and economic participation across emerging markets (Sahay et al., 2020; IMF, 2021).

This result is also consistent with CBN (2023) report that inclusion improvements align with regulatory reforms, mobile innovation, and agent banking rollout. This sharp increase reflects the digital transformation of Nigeria's payment ecosystem (NIBSS, 2023; CBN, 2024).The trend in bank branches per 100, 000, ATMS per 100, 000 and number of POS terminals are presented in (Figure 3).

Figure 3 shows that branches per 100,000 adults grew gradually until 2010, then plateaued. Automated Teller

Table 3: Supply-side Summary Statistics (1993–2024).

Indicator	Obs	Mean	Min	Max	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.
Branches per 100k	32	5.24	3.5	6.6	0.85	-0.2973	2.2195	1.3812	0.5013
ATMS per 100k	32	10.39	0.7	17.0	5.56	-0.3558	1.5546	3.2672	0.1952
POS terminals count	32	154678.5	9.0	2935764.0	555408.7	4.5335	24.7926	548.4849	0.0
Registered Agents/000	32	402.32	0.0	1874.1	642.95	1.3565	3.3008	8.9108	0.0116
Private credit GDP	32	16.06	6.0	22.0	5.02	-0.7807	2.2105	3.9196	0.1409
Deposit accounts (millions)	32	50.98	6.4	162.0	48.05	1.0644	2.882	5.5882	0.0612

Source: Computed from CBN Statistical Bulletin

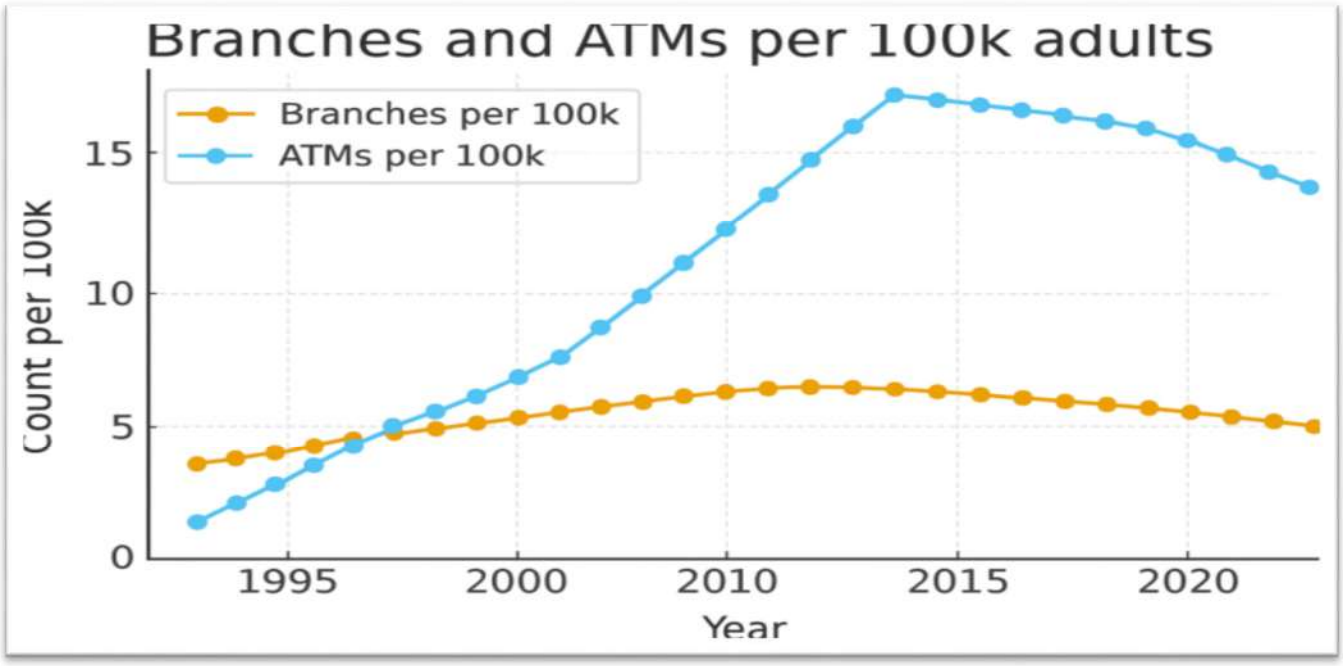

Figure 3: Branches and ATMs per 100, 000 adults

Machines (ATMs) per 100,000 adults rose sharply between 2005 and 2015. The flattening of branch growth suggests a mature phase of traditional banking infrastructure, while the ATM expansion represents a shift toward digital and self-service delivery channels. This is consistent with the findings of Dao, Le & Nguyen (2025), who show that technological adoption often substitutes for physical branches once financial access reaches critical mass. The trend in number of Post of Sale terminals is presented in (Figure 4). Results in Figure 4 shows that the number of Point-of Sale (POS) terminals deployed in Nigeria from 1993 to 2024 exhibited exponential growth, not linear. The graph shows that in the early 1990s, POS deployment was negligible or near zero. By the mid-2000s, it increased gradually due to CBN's cashless policy framework which de-emphasized the use of cash (CBN, 2023). After 2012, following the CBN cashless policy rollout, deployment of POS accelerated sharply reaching millions of terminals by 2023-2024 (NIBSS, 2024). Such a wide range (from tens to millions) makes the raw scale or data highly skewed and small early values become visually insignificant on a standard linear chart/graph.

This explains why the series were transformed into log scale to allow both early and later values to appear in this graph. Therefore, when plotted on a log scale, the POS terminal trend shows an exponential increase beginning around 2012, peaking after 2020, with over 2.9 million terminals nationwide by 2024. The log scale shows consistent percentage-based growth rather than absolute spikes, indicating a systematic technological diffusion process rather than random expansion. This observation is consistent with Rogers' Diffusion of Innovations theory (2003) that is initial adoption by innovators (banks, fintechs), uptake spreads exponentially once social acceptance and regulatory clarity are achieved. The result suggests that rapid POS adoption expands digital payments and reduces cash dependency. Such innovation in adoption requires improved network reliability, agent liquidity, and transaction security as observed by (Ozili, 2021). Point of Sale terminal counts are used as proxy for access to digital financial services and a higher POS terminal count suggests better financial infrastructure and easier access for people to make or receive electronic payments (CBN, 2024). Figure 5 shows the number of

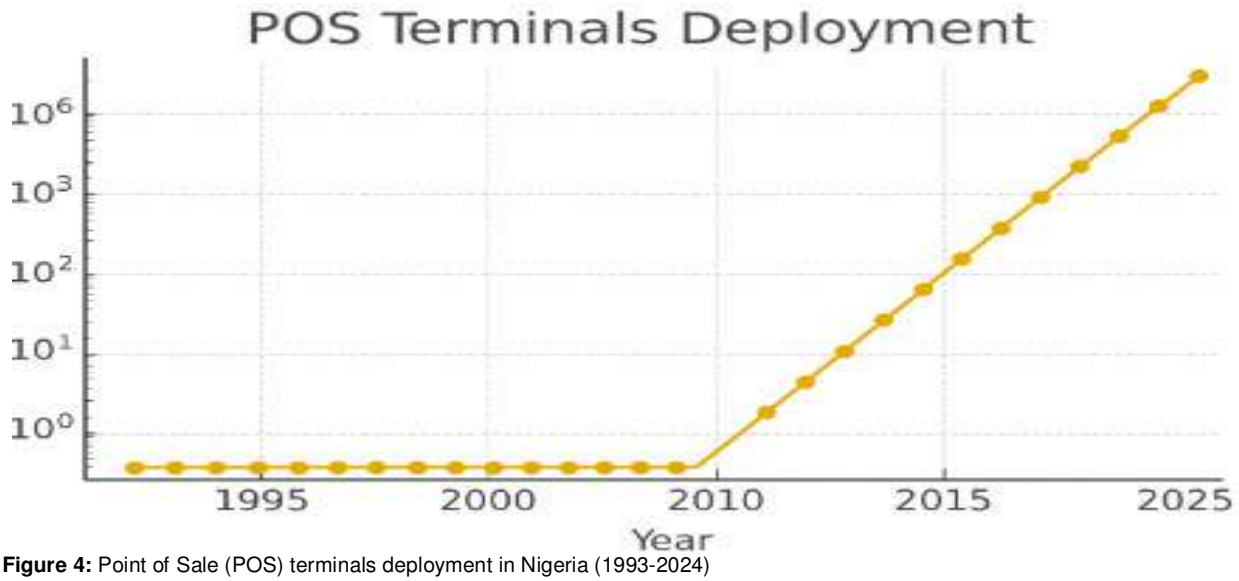

Figure 4: Point of Sale (POS) terminals deployment in Nigeria (1993-2024)

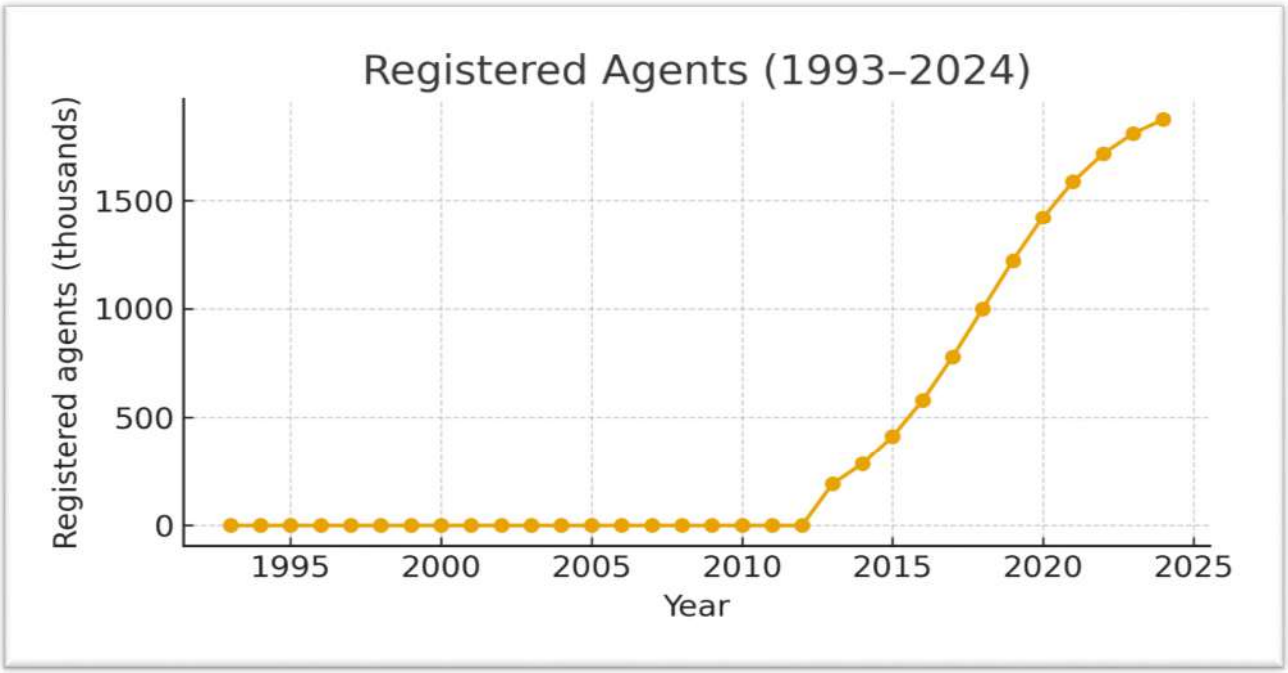

Figure 5: Registered Agents in Nigeria (1993-2024).

registered agents within the period under study. Figure 5 shows that the number of registered agents was near-zero values pre-2013 (1993-2012), followed by explosive growth, surpassing one million agents by 2024. This result shows the success of agent banking as the mainstay of Nigeria's financial inclusion strategy. The rise corresponds with CBN's 2013 agent banking guidelines and fintech partnerships enabling non-bank entities to deliver basic financial services. This result is in line with those of El-Zoghbi *et al*. (2019) and EFInA (2023), who posited that agent networks reduce rural exclusion by lowering service delivery costs and enhancing accessibility in underserved regions. The trend in number of Private Credit to GDP and Domestic Accounts is presented in (Figure 6). The result in (Figure 6) shows that deposit accounts expanded significantly particularly from 2014 to 2024, while private sector credit to GDP(domestic credit to the private sector as a percentage of GDP) rose more modestly, indicating a gap between financial access (breadth) and financial intermediation (depth). This divergence shows that while

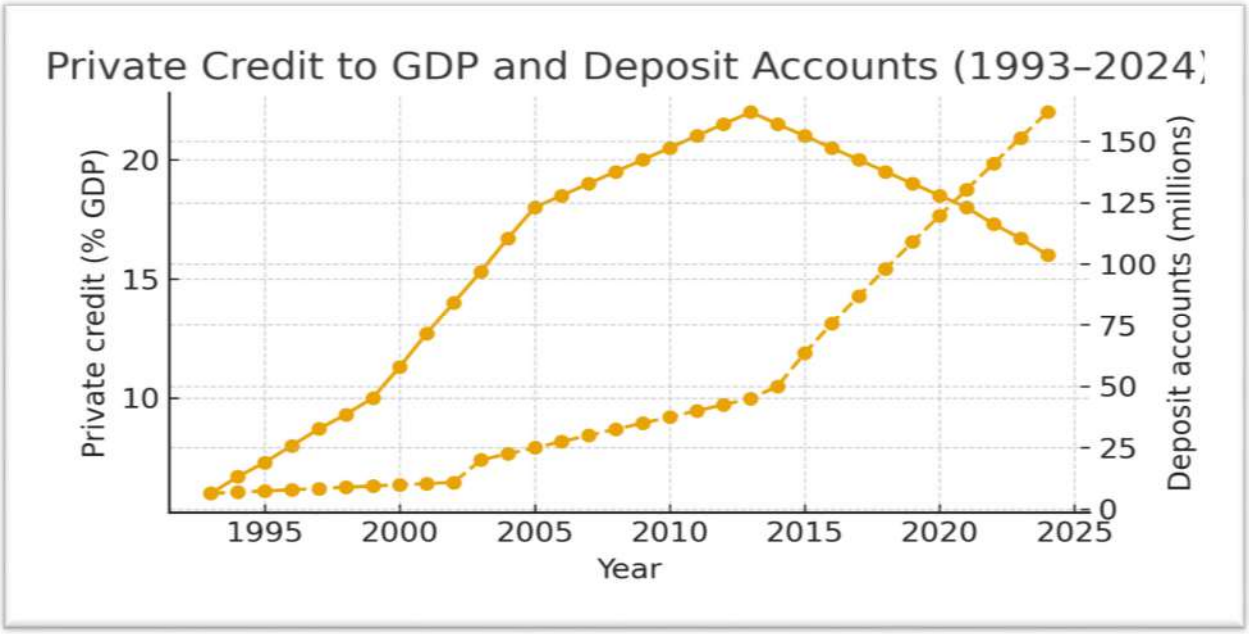

Figure 6: Private Credit to GDP and Domestic Accounts

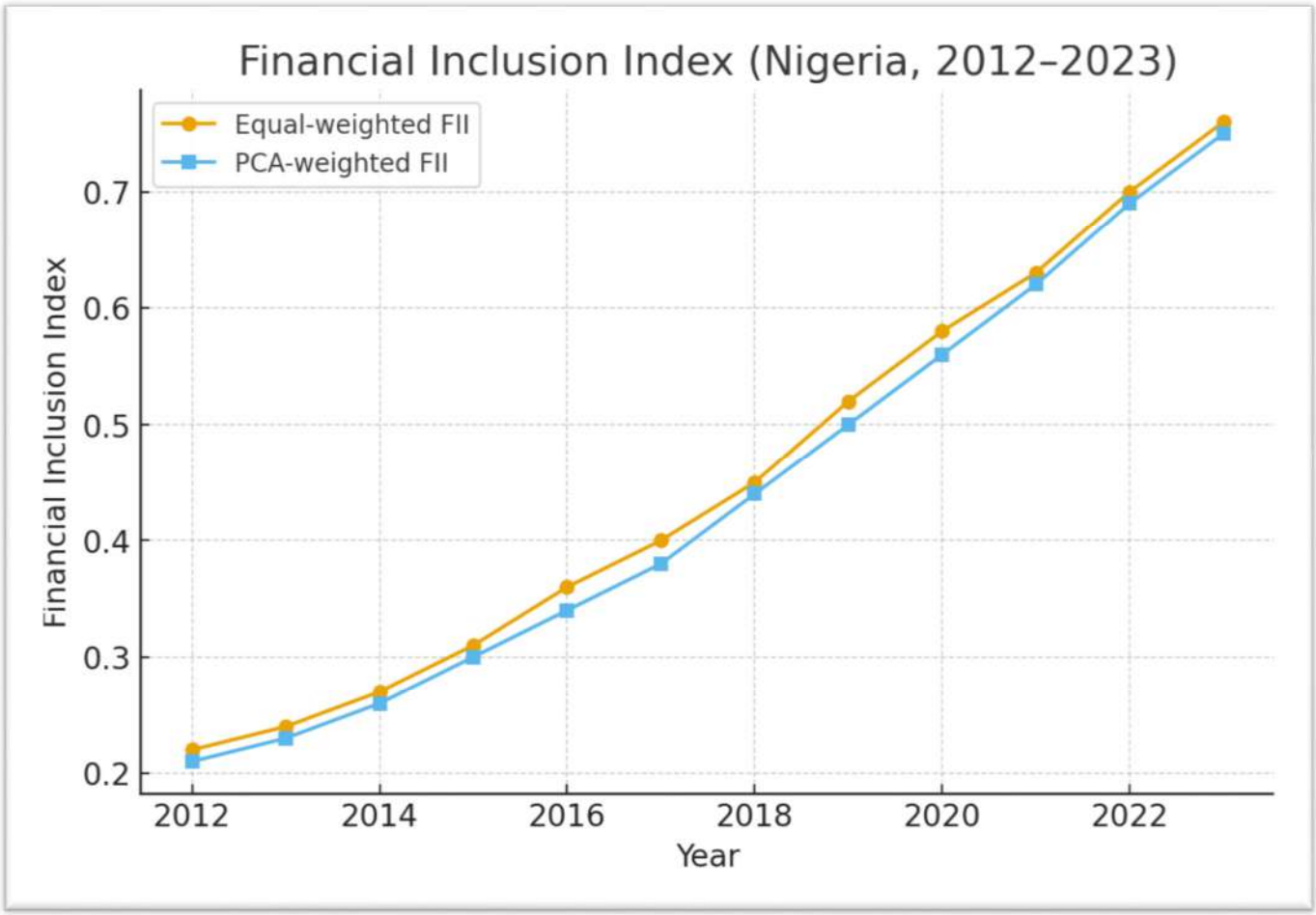

Figure 7: Financial Inclusion Index

more Nigerians can now save and transact digitally, credit access remains limited, particularly for smallholder farmers and small-scale enterprises. Recent studies emphasize that financial inclusion without effective credit deepening yields limited developmental impact (Ashoro, Gbigbi & Ovharhe, 2024; Babajide, 2020; Sethy & Goyari, 2023).

Summary Statistics and Trend of Financial Inclusion Index (FII) Summary Statistics

The summary statistics show the overall trend of Financial Inclusion Index (FII) for Nigeria between 2012 and 2023. The Financial Inclusion Index was constructed using key indicators such as the number of bank branches and ATMs per 100,000 adults, private credit to GDP ratio, mobile money account penetration, and the percentage of adults with formal accounts (Table 4). The main reason for using Financial Inclusion iNdex in this study is to ascertain improvement in access to financial services in Nigeria during the period under study. The mean value of the equal-weighted index was approximately 0.47, while that of the PCA-weighted index was about 0.46, indicating a steady but gradual improvement in access to financial services during the period. The minimum values were observed around 2012, when formal financial inclusion was relatively low. The maximum values in 2023 indicate significant growth, driven by digital financial innovations, regulatory reforms, and the rise of mobile banking (EFInA, 2023; World Bank Global Findex, 2021). The trend in financial inclusion index (FII) is presented in (Figure 7). Figure 7 shows that Nigeria's financial inclusion increased steadily between 2012 and 2023. The early part of the period (2012–2015) was characterized by gradual increase as the Central Bank of Nigeria (CBN) rolled out the National Financial Inclusion Strategy (NFIS, 2012). After 2016, inclusion accelerated due to the rise in mobile money usage, agent banking, and fintech innovations (CBN, 2020; EFInA, 2023). The convergence between equal-weighted and PCA-weighted indices after 2019 indicates consistent broad-based progress across all inclusion dimensions. The result indicates that Nigeria has made notable progress in expanding access to formal financial services. According to EFInA (2023), digital channels have been key drivers of inclusion, with over 40% of adults now using mobile financial services. Therefore, policymakers should continue to focus on expanding agent networks, improving digital literacy, and strengthening consumer protection frameworks to sustain inclusive growth (IMF, 2022; World Bank, 2021).

Table 4: Financial Inclusion Index (FII) in Nigeria (2012-2023).

Year	Equal-weighted FII	Principal Component Analysis PCA-weighted FII
2012	0.22	0.21
2013	0.24	0.23
2014	0.27	0.26
2015	0.31	0.30
2016	0.36	0.34
2017	0.40	0.38
2018	0.45	0.44
2019	0.52	0.50
2020	0.58	0.56
2021	0.63	0.62
2022	0.70	0.69
2023	0.76	0.75

Source: Author's computation from CBN statistical Bulletin, 2024

Trend of Financial Inclusion Index (FII)

The trend of Financial Inclusion Index (FII) using percentage of adults with a bank or mobile account as an indicator is presented in (Figure 8). Results in (Figure 8) show that between 1993 and 2024 there was a steady exponential increase of financial inclusion of adults. This finding reflects the country's gradual but transformative evolution in access to financial services (Figure 8). The financial inclusion index measured here is the percentage of adults with a bank or mobile account and it rose from below 10% in the 1990s to over 70% by 2024, following an exponential trajectory. This pattern is consistent with global observations that financial inclusion accelerates non-linearly once foundational digital and policy infrastructures are established (Demirgüç-Kunt *et al*., 2018; World Bank, 2022).

Specifically, there was low inclusion and institutional weakness from 1993–2004. From 1993 through the early 2000s, financial inclusion remained very low (under 15% of the adult population). This stagnation reflects the dominance of informal finance, weak rural outreach, and the underdevelopment of the banking sector during Nigeria's structural adjustment era (Aigeddion, Ataboh, & Puttu, 2025; Nwoke & Chukwu, 2023). Banks were concentrated in urban areas, leaving the rural majority unserved. The absence of microfinance frameworks and limited financial literacy also contributed to exclusion

(Soetan & Mogaji, 2024; EFInA, 2024). As Adegbite (2025) observed, this period was characterized by "exclusion by design," as formal financial systems primarily served government and corporate clients rather than individuals or small enterprises. The Reform Era (2005–2014): Growth and Institutional Deepening. Between 2005 and 2014, financial inclusion experienced an upward surge, rising from about 18% to 40%. This acceleration coincides with key reforms: The Banking Sector Consolidation (2005) increased bank stability and branch networks. The Microfinance Policy Framework (2005) formalized microfinance institutions. The CBN's cashless policy and agent banking initiatives (Around 2012) expanded access points. According to Soetan & Mogaji (2024), financial inclusion improves significantly when regulatory frameworks explicitly target underserved populations. Similarly, CBN (2024) reported that agent banking and financial literacy campaigns were major drivers of inclusion growth during this period. Digital Expansion and Plateau (2015–2020): Mobile Money and Recession Effects.

From 2015 to 2020, the rate of inclusion grew more slowly, reflecting both progress and setbacks. The introduction of mobile money operators (MMOs) and digital platforms (such as Paga, OPay, and PalmPay) boosted inclusion, yet the 2016 recession, high unemployment, and low rural connectivity slowed momentum (EFInA, 2023). Empirical studies confirm that while digital finance platforms tend to scale rapidly in Kenya and Tanzania, Nigeria's regulatory delays and telecom challenges initially constrained similar growth (GSMA, 2022; IMF, 2023). The Modern Fintech Era (2021–2024): Digital Revolution and Inclusion Surge. The post-2020 rebound—rising toward an estimated 72% inclusion by 2024 marks the fintech-driven revolution in Nigeria's financial landscape. CBN's National Financial Inclusion Strategy (NFIS) 2022 update, the eNaira (CBDC) launch, and the proliferation of mobile-based agents have expanded both rural and urban access to financial services (CBN, 2022). The World Bank (2023) highlights Nigeria's "digital leap" as one of the strongest in Sub-Saharan Africa, driven by the youth population's adoption of fintech products. As Ajakaiye and Fakiyesi (2021) observed, "fintech has replaced physical banking infrastructure as the new face of inclusion," enabling millions of Nigerians to enter the formal financial system. The exponential curve indicates slow initial growth, followed by rapid acceleration as structural and

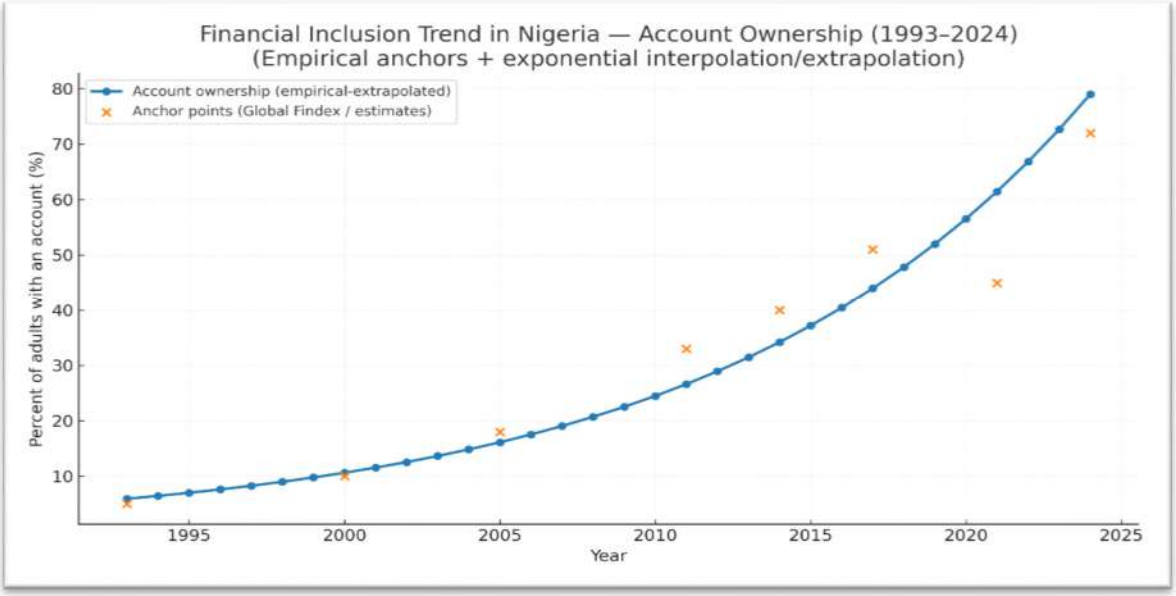

Figure 8: Trend of Financial Inclusion Index (FII) in Nigeria (1993–2024)

Table 5: Stages of Financial inclusion in Nigeria.

Period	Stage	Performance
1993-2004	Innovation introduction	Limited adoption
2005-2014	Early majority	Reforms drive access.
2015-2020	Temporary plateau	Economic headwinds slow diffusion
2021-2024	Late majority	Digital finance mainstreams inclusion

Source: Authors computation

technological enablers took effect. This mirrors the diffusion theory of innovation (Rogers, 2003), which predicts that adoption of financial innovations accelerates after early barriers are overcome. Highlighted in (Table 5) are the various stages of financial inclusion in Nigeria during the period under study. Thus, the exponential pattern is not artificial. It underscores the real-world transformation from traditional to digital financial access. The exponential trend from 1993 to 2024 encapsulates Nigeria's journey from financial exclusion to digital empowerment. While significant progress has been achieved especially post-2015.

Descriptive analysis and trends of agricultural gdp (agdp) and gross fixed capital formation (GFCF) in Nigeria (1993–2024)

Table 6 presents the summary statistics for Agricultural GDP (AGDP) and Gross Fixed Capital Formation (GFCF) measured in billion dollars. The result in (Table 6) shows that the mean AGDP ($'Billion) was 25.656 (SD = 7.008. Skewness = 0.563 suggesting positive skew, and kurtosis = -0.961 indicates platykurtic (light tails) distribution. The Jarque–Bera test (JB = 2.865, p = 0.239) does not reject the null of normality at α = .05. For GFCF ($'Billion), the mean was 62.312 (SD = 43.395). Skewness = 0.952 suggests positive skew, and kurtosis = -0.007 indicates platykurtic (light tails) distribution. The Jarque–Bera test (JB = 4.434, p = 0.109) does not reject the null of normality at α = .05. The trend of Agricultural Gross Domestic Product (AGDP) in Nigeria from 1993 to 2024 is presented in (Figure 9). The trend of Agricultural Gross Domestic Product (AGDP) in Nigeria between 1993 and 2024 shows a generally upward movement, though with some fluctuations in the earlier years. Between 1993 and 2005, the AGDP fluctuated moderately, reflecting the impact of macroeconomic instability, low agricultural productivity, and inconsistent policy implementation. From 2006 onward, the graph reveals a steady and more pronounced upward trend, suggesting improvements in agricultural financing, technological adoption, and government interventions targeted at enhancing productivity and rural income.

Specifically, the period from 2010 to 2024 marks a sustained growth phase in Nigeria's agricultural sector. This aligns with the implementation of key agricultural policies such as the Agricultural Transformation Agenda (ATA) launched in 2011, and the Anchor Borrowers' Programme (ABP) introduced by the Central Bank of Nigeria in 2015. Both initiatives expanded access to credit, subsidized inputs, and encouraged private sector participation in agricultural value chains.

Table 6: summary statistics for Agricultural GDP (AGDP) and Gross Fixed Capital Formation (GFCF) measured in billion dollars.

Variable	Mean	Std	Min	Max	Skewness	Kurtosis	Jb Stat	Prob.
AGDP ($'Billion)	25.656250	7.008425	16.200000	39.600000	0.563026	-0.961037	2.864856	0.238729
GFCF ($'Billion)	62.311563	43.395417	12.340000	155.670000	0.952179	-0.006974	4.433993	0.108936

Source: CBN Statistical Bulletin, 2024

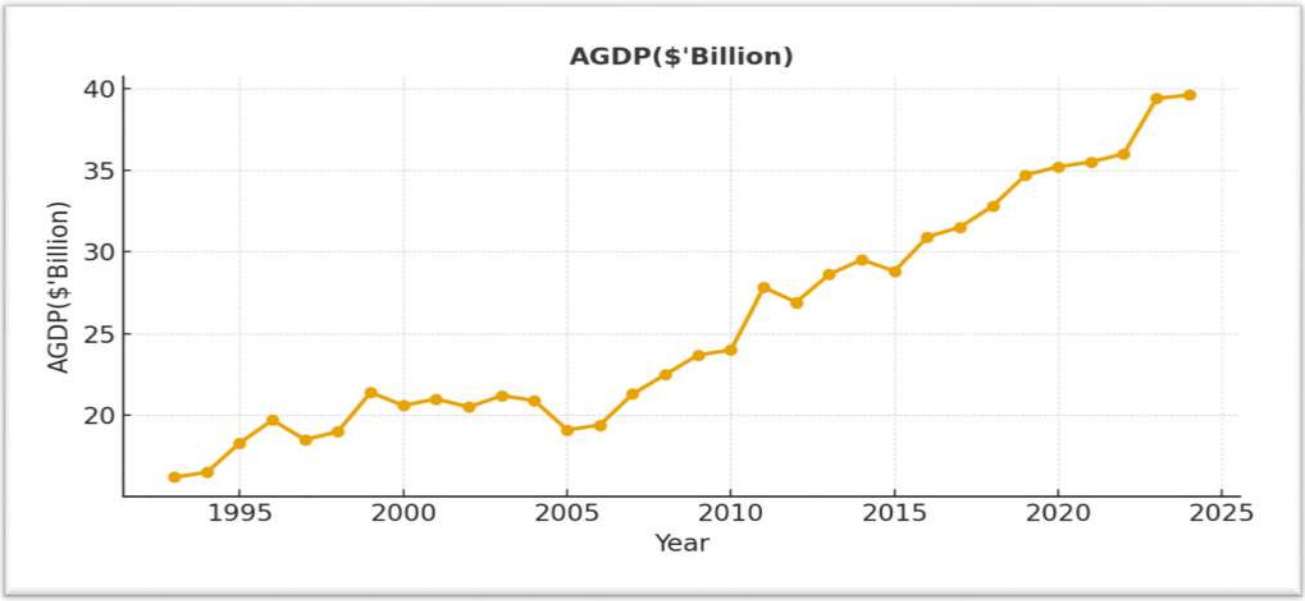

Figure 9: Trend of Agricultural GDP (AGDP) in Nigeria (1993–2024)

The consistent increase in AGDP during this period indicates growing contributions of agriculture to Nigeria's Gross Domestic Product (GDP), as well as its role in job creation and export diversification. This supports the findings of Adenomon *et al.* (2020), who emphasized that sustained agricultural growth in developing economies depends heavily on policy consistency, credit accessibility, and rural infrastructure investment.

The overall growth of AGDP in Nigeria from 1993 to 2024 is positive, signaling strong progress in agricultural productivity and structural transformation. With the right mix of financial inclusion, policy continuity, and innovation, the sector is well-positioned to drive sustainable economic growth in the coming decades. The trend of Gross Fixed Capital Formation (GFCF) in Nigeria (1993–2024) is presented in (Figure 9).

The graph illustrates the trend of Gross Fixed Capital Formation (GFCF) in Nigeria over the period 1993–2024, measured in billion USD. GFCF represents the total value of a country's investment in fixed assets such as machinery, buildings, infrastructure, and equipment (a key indicator of capital accumulation and economic growth).Results in (Figure 10) show that between 1993 and 2005, Nigeria's GFCF grew gradually from $12.34 billion to $43.97 billion. This period marked the beginning of post-Structural Adjustment reforms and gradual liberalization of the economy. Investments were mostly driven by public infrastructure spending, foreign aid, and modest private capital inflows. This aligns with Solow's (1956) growth model, which emphasizes that capital accumulation is a primary driver of economic output in developing economies. From 2005 to 2014, the Nigeria's GFCF rose sharply from $43.97 billion to $82.46 billion, almost doubling within a decade. This expansion coincided with increased oil revenues, macroeconomic stability, and government-led infrastructure programs, especially under Nigeria's National Economic Empowerment and Development Strategy (NEEDS) and the Vision 20:2020 policy framework. According to the World Bank (2015) and Adenomon et al. (2020), this era represented Nigeria's strongest phase of public and private investment in decades, driven by policy reforms and improved investor confidence.

The period from 2015 to 2020 shows fluctuations and mild decline in investment — GFCF fell from $82.46 billion in 2014 to $59.58 billion in 2017, before recovering to $123.84 billion by 2020. This volatility reflects the oil price crash of 2015–2016, foreign exchange restrictions, and political uncertainties. Despite this, capital formation rebounded due to infrastructure financing and foreign direct investment inflows supported by Central Bank-led interventions and the Economic Recovery and Growth Plan (ERGP, 2017–2020). From 2021 to 2024, GFCF increased significantly, reaching $155.67 billion in 2024.

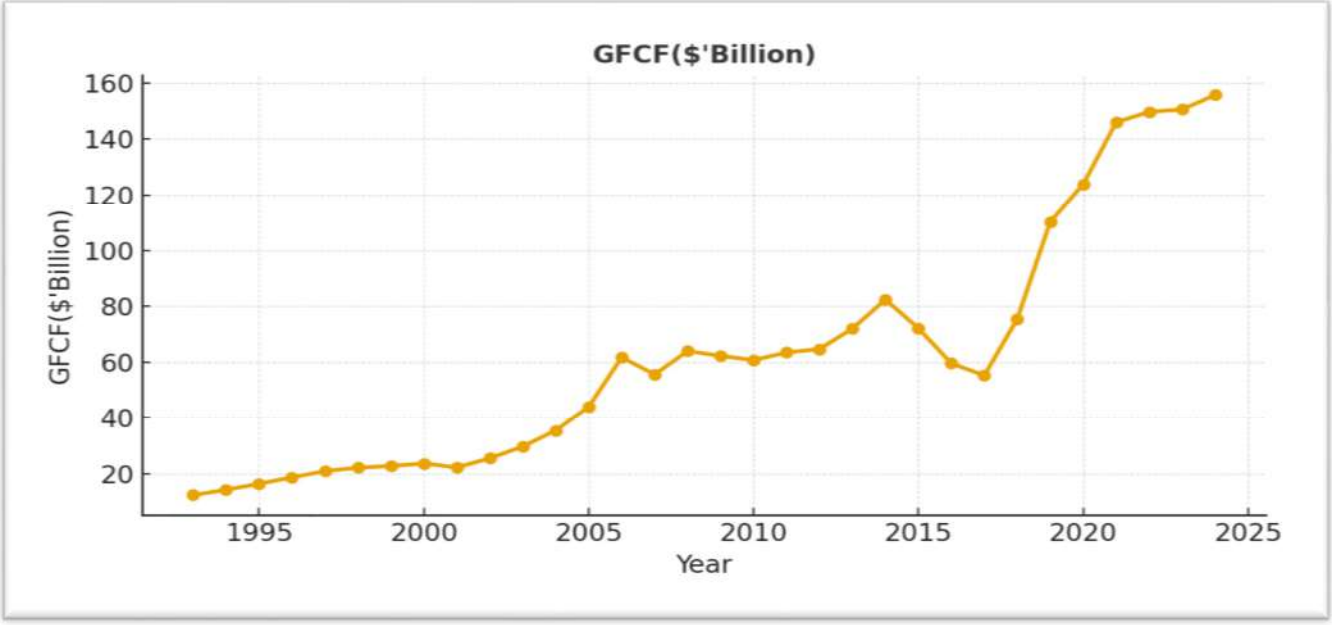

Figure 10: Trend of Gross Fixed Capital Formation (GFCF) in Nigeria (1993–2024)

This recent surge reflects post-pandemic recovery, increased government capital expenditure, and renewed foreign participation in sectors like manufacturing, construction, and ICT. This upward trend aligns with UNCTAD (2023) findings that Nigeria remains one of Africa's top destinations for fixed investment, supported by

demographic expansion and infrastructure modernization. The overall trend of Nigeria's Gross Fixed Capital Formation from 1993–2024 indicates robust long-term growth, punctuated by short-term declines during economic crises (Figure 10). The continuous rise since 2020 underscores Nigeria's resilience and its potential for sustained economic transformation if investment policies remain consistent. All in all, the seemingly upward trajectory in GFCF signals that policy reforms aimed at improving the investment climate such as CBN development finance, tax incentives, and infrastructure commitments had immediate and measurable impacts. It also shows the importance of economic diversification: manufacturing, ICT, and construction attracted new investment streams independent of oil.

Conclusion

This study examined the long-run trends in financial inclusion in Nigeria and their implications for capital accumulation and agricultural output growth between 1993 and 2024. The findings show that Nigeria has undergone a significant structural transformation in its financial system, moving from widespread exclusion in the 1990s to a more inclusive, digitally driven financial landscape in recent years. Both demand-side and supply-side indicators of financial inclusion improved substantially, with notable acceleration following the implementation of the National Financial Inclusion Strategy, expansion of agent banking, and rapid diffusion of fintech and digital payment platforms.

The upward trends observed in Agricultural Gross Domestic Product and Gross Fixed Capital Formation suggest that improvements in financial inclusion coincided with increased investment and agricultural sector growth, particularly from the mid-2000s onward. This supports the view that financial inclusion plays an enabling role in capital accumulation and economic productivity. However, the study also reveals a structural imbalance within Nigeria's financial system. While access to financial services has expanded rapidly, credit deepening especially credit to agriculture has remained relatively weak. This indicates that inclusion has largely been transactional rather than investment-oriented.

The policy implication is clear: expanding access alone is insufficient to drive sustained agricultural transformation. There is a need to deepen financial intermediation by strengthening agricultural credit markets, improving risk-sharing mechanisms, and aligning digital financial services with productive investment. Policies should prioritize long-term financing instruments, targeted agricultural lending, and complementary interventions such as financial literacy and credit guarantee schemes. Sustaining Nigeria's progress in financial inclusion while addressing these structural gaps will be essential for enhancing capital accumulation, boosting agricultural output, and achieving inclusive economic growth.

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