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Effect of Financial Technology on Economic Development in Nigeria: A Time Series Analysis (2006 – 2022)

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ABSTRACT:This study is an investigation into the effect of financial technology on economic development in Nigeria. In nations where financial models centered on digital activities are used, agents and creative consumer education are employed to encourage low-income populations to embrace technology with the express goal of advancing both economic development and inclusion. The study used an ex post facto research design, and the World Bank and Central Bank of Nigeria (CBN) provided carefully chosen secondary data. Using data from 2006 to 2022, the models were estimated using the Auto-Regressive Distributive Lag (ARDL) estimation technique and the granger causality test. The study revealed that there is an insignificant negative relationship between volume of mobile banking, internet banking, point of sale terminal transactions, and human development index in Nigeria. On the contrary, value of transactions on automated teller machine was found to have insignificantly and positively associated with human development index in Nigeria. Similarly, the granger causality result revealed that the inducing effects of financial technology were found to have no significant effect on human development index. To this end, this study concludes that financial technology has no significant effect on economic development in Nigeria. Although financial technology has the potential to revolutionize Nigeria's economy, its full effects are still not being felt by many. Strengthening connectivity and infrastructure is necessary to realize this promise. The digital infrastructure is the foundation of financial technology. However, unstable energy and inadequate internet connectivity continue to plague many Nigerian rural and semi-urban communities. The government must give broadband internet, reliable electricity, and mobile network coverage top priority in order to increase access to financial technology services. By extending digital infrastructure to underserved locations, public-private partnerships can assist reach the 38% of Nigerians who do not have access to banking services.

Keywords: Financial technology, economic development, Nigeria

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1. INTRODUCTION

Nigeria has implemented several policies over time to achieve inclusive growth and development, and expand access to financial technology and financial inclusion. Money transfers, insurance, payments, and deposits

are only some of the FinTech services available online, via apps, funding for businesses, mobile phones, and other electronic devices (Humby, 2020). Traditional African savings systems, such as the Esusu and thrift plan tactics, which attract very little interest on loans, have also incorporated FinTech (Olatunji, 2020). These services have flourished in growing economies of Africa such as Nigeria, because to their ease of use and the fact that they do not require the consumer or account holder's physical presence. With Nigeria recording an increasing poverty rate above 60 percent, the World Bank and other International Agencies believe that the advent of financial technology will enhance the living standards of the people and serve as an avenue for poverty alleviation especially in rural Nigeria. The poverty rate in Nigeria reached a new height, jumping from 54.5% in 2004 to 69.0% in 2009, then again to 51.4% in 2020, and was estimated to be well over 60% by the end of 2021 (NBS, 2022). The Human Development Index (HDI) for Nigeria also increased, from 0.465 in 2005 to 0.534 in 2019 (a 14.8% rise). In 2021, Nigeria's HDI stayed at 0.535, which was essentially the same as the previous year. Based on the World Bank classifications, a HDI of 0.535 is considered a low human development index thus confirming Nigeria's worsening poverty level. However, Usman (2020) posited that innovations in the financial sector through FinTech have the potential to lift Nigeria's human development above the current level. The increasing incidence of poverty, both within and among locations, was in spite of various resources and efforts exerted on poverty related programmes and scheme in the country, thus suggesting that the programmes and the schemes were ineffective and ineffectual.

Nigeria embraced the use of electronic banking in the early 2000s (CBN, 2019). The proliferation of e-banking in the country can be attributed in part to the dynamism of technology, such as the introduction of mobile telephones in 2001 and increased access to personal computers and Internet service facilities. Prior to 2003, only a select few financial institutions maintained their own proprietary Automated Teller Machine (ATM) fleets (Oluwatosin, 2017). Nigeria's primary shared ATM network, Inter-switch, went live in 2003 with five machines from United Bank for Africa and First Bank of Nigeria (Onodugo & Ifeanyi 2015). However, since 2009 when e-banking services were fully launched to the general public, ATM transactions have averaged ₦2.5 trillion for the period 2009 to 2018 while mobile pay

services averaged ₦422 billion within the same period (NIBSS, 2018). According to Ondiege (2017), the increase in e-banking transactions motivated the financial service providers to create retail banking services thus empowering locals to own one of these financial technologies and utilize same to offer financial services to the public thereby creating employment and empowerment.

It is no longer news that modern technology and innovation have shaped the world in positive ways. When we talk of e-commerce, the internet, etc., we are referring to the banking and financial systems that are enclosed in the acronym "FinTech". Innovative financial technology such as mobile apps, Unstructured Supplementary Services Data (USSD), Automated Teller Machines (ATM), Point of Sales (POS) services, third-party payment apps like Interswitch, Momo, Paystack etc. can help to make financial inclusion easier and faster for the people. Researchers such as Oleleye and Oyeneye (2022), Moulatsiotis (2015), and Lal (2018) among others made a case for the advancement of financial inclusion through making financial technology accessible to retail service providers. The role of Fintech in alleviating poverty is very fundamental. Financial technology is an aspect of financial inclusion, which is a trend aimed at alleviating poverty through the reduction of disparity between the different segments of society. Unless the poor are part of a country's growth process, which may be the case if their earnings and capacity to acquire human capital fail to keep pace with the rest of the country, overall poverty may not drop over the longer term. Hence, it is imperative that governments bring the poor into the growth process. A dwindling human development ranking means that the financial sector needs ample innovations to lift economic development because access to finance has been argued to be a contributing factor to a growing economy. Against this background, this study seeks to examine the effect of financial technology on economic development in Nigeria.

2. LITERATURE REVIEW

Conceptual Issues

Financial technology is regarded as reshaping the financial services sector through new business models for wealth management, payments, lending, crowd funding, and capital markets. The development of financial technology has been proven to bring benefits to consumers, business actors and the national economy, but on the other hand, it has potential risks that can destabilize the

financial system (Putri, Farhan, & Najawa, 2018). For the past two decades, the continued application and spread of the internet and online business and advancements in Information Technology (IT) has significantly transformed global economic activity (Putri, Farhan, & Najawa, 2018; Ekwunife, Nduka, & Ogini, 2022; Nduka, Atueyi, Osakwe, & Mbanefo, 2021; Obidike, Onyeka, & Nduka, 2022). Moreover, the effective use of Fintech may affect other macroeconomic factors, such as the availability of labour force due to advancements in technology which reduces the cost of machinery and equipment and thus motivates businesses to shift from human labour to capital (Deng, et. al. 2019). Thus, studies described Fintech as a breakthrough innovation where companies integrate technological innovations with financial services (Dorfleitner, et.al, 2017).

Economic development is a multifaceted process through which the economic well-being and quality of life of a population are improved. It goes beyond the simple increase in a nation's gross domestic product (GDP), encompassing social, institutional, and structural changes aimed at enhancing human capabilities and reducing poverty (Todaro & Smith, 2020; Logan, Okanya, Nduka, Manasseh, Ede, Onoh, Omeje, Ozioko, & Agu, 2021). Unlike mere economic growth, which refers to increases in output or income, economic development involves qualitative improvements in people's lives including better education, health care, infrastructure, and governance. Human capital: skills, education, and health are vital. Development cannot proceed without a healthy and skilled labor force. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2024) reported that educational investment remains uneven across the globe, with nearly 244 million children and youth out of school. Meanwhile, health crises like the COVID-19 pandemic exposed the weaknesses in many nations' health systems, setting back development by years [United Nations Development Programme (UNDP, 2023)]. The Human Development Index (HDI)**,** developed by the United Nations Development Programme, combines data on life expectancy, education, and per capita income to assess overall development (UNDP, 2023).

Theoretical Foundation

The main theoretical foundation linking financial technology (FinTech) and economic development is grounded in financial

intermediation theory**,** extended through the lens of innovation diffusion theory**.** Financial intermediation is the role of channeling money from net savers who have idle funds to investor or net borrowers who are in need of funds. Chukwu, Akunna, and Anaike (2024), Monogbe, Akinpelumi, Achugbu, and Nduka (2016), Nduka, Ananwude, and Osakwe (2019), and Ogunewe, Ananwude, and Nduka (2020) emphasized that the presence of intermediaries improves economic well-being. They further explained that financial intermediaries were created to fulfill specific needs of both savers and borrowers, and to reduce the inefficiencies that would otherwise exist if users of funds could get loans only by borrowing directly from savers. Finance is required for different purposes by different people, organizations, and other economic agents. To provide the needed finance, there are varieties of institutions rendering financial services. Deposit money banks are among such institutions that render financial services. They are mainly involved in financial intermediation, or indirect financing which involves channeling funds from surplus unit to the deficit unit of the economy, thus transforming bank deposits into loans and credits. The diffusion innovation theory was advocated by Rogers in 1962 posit that diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread through cultures. He explains that critical factors that determine the adoption of an innovation at the general level are the following: relative advantage, compatibility, complexity, trial-ability and observability. In the context of financial technology adoption, benefits such as immediacy, convenience and affordability to customers have been reported. Thus, it is assumed that, when customers perceive distinct advantages offered by financial technology, they are more likely to adopt it (Wasilwa & Omwenga, 2016; Aniefor, Nduka, Ananwude, & Ezeaku, 2021). Compatibility refers to the degree to which a service is perceived as consistent with users' existing values, beliefs, habits and present and previous experiences (Wasilwa & Omwenga, 2016; Anusi & Nduka 2022; Nduka, Achugbu, & Ucheahara, 2016). Compatibility is an important feature of innovation as conformance with user's lifestyle can propel a rapid rate of adoption. Observability of an innovation describes the extent to which an innovation is visible to the members of a social system, and the benefits can be easily observed and communicated. According to Rogers trial-ability is defined as the capacity to experiment with new technology before adoption. Potential adopters who are allowed

to experiment with an innovation will feel more comfortable with it and are more likely to adopt it. Perceived risk refers to the degree of risks in using an innovation.

Empirical Studies

Sackey, Ackah, and Asabi (2025) assessed the impact of fintech and digital platforms on financial inclusion in the informal sector of Ghana. A descriptive cross-sectional research design was employed to select 365 participants in the informal sector from eight regions of Ghana through multistage sampling method for data collection. Data was collected using a 5-point Likert scale that was adapted with items to assess the role of Fintech and adoption by people in the informal sector. After the data was analyzed with SPSS software version 23.0, it was a found that majority of participants took a neutral stance on the role and adoption of fintech.

Chukwu, Akunna, and Anaike (2024) investigated the effect of financial technology on Nigeria's economic development from 2006 to 2022, utilizing secondary data sourced from the Statistical Bulletin of the Central Bank of Nigeria and the United Nations Annual Report. Employing ARDL (auto-regressive distributed lag) models, the research analyzed the influence of independent variables such as automated teller machines (ATM), point of sale (POS), internet banking, and mobile banking on the dependent variable, the Human Development Index (HDI). The findings revealed that fintech had an insignificant effect on Nigeria's Human Development Index.

Using the CRITIC approach, Sreenu and Verma (2024) thoroughly analyses FinTech and digital economy metrics in all 28 states of India from 2010 to 2022. A thorough analysis of this data uncovers the complex relationships and interactions between FinTech and the digital economy. The findings clearly demonstrated the significant impact of FinTech on India's digital economy.

Tidjani and Madouri (2024) explored the nexus between sustainable development and finance, with a specific focus on the African region–a critical yet underexplored context in the existing literature. The empirical exploration spans 25 African countries from 2011 to 2019, employing econometric methods such as dynamic panel (SGMM two-steps) and static panel (OLS, FE, LSDV). Utilizing key indicators like Adjusted Net Savings (ANS) and Gross Saving rate (GS), they findings reveal a substantial positive impact of financial inclusion and FinTech on

sustainable development. However, an intriguing discovery emerges as the interaction between these variables exhibits a weak negative and significant effect.

Obilikwu (2024) investigated the impacts of financial technologies on financial development in Nigeria. The study applied Auto-Regressive Distributed Lag (ADRL) estimation technique using quarterly data from 2009 to 2023 for the estimation. Findings indicate that, among the financial technology (fintech) variables, internet banking (IB) has a positive effect on financial development in the long run, but no significant effects in the short run. While, point of sales (POS) exerted a positive effect in the short run but has no significant effect in the long run. On the economic factors included as control variables, inflation rate (IFR) has negative effects on financial development in the short run and positive effects in the long run. Interest rate (INT) exerted negative effects on financial development the long run but no significant effect in the short run. Economic growth (RGDP) positively affects financial development only in the short run but negative effects in the long run.

Ngong, Thaddeus, and Onwumere (2024) examined the causation linking financial technology to economic growth in the East African Community states from 1997 to 2019. Autoregressive distributed lag is used. Gross domestic product per capita proxies economic growth, automated teller machines, point of sale, debit card ownership and mobile banking measure financial technology. The results unveil a significant relationship between financial technology and economic growth. The findings show bidirectional causality between automated teller machine and economic growth, with unidirectional causation from economic growth to point of sales and internet banking, mobile banking and government effectiveness to economic growth. The error correction term is negatively significant, demonstrating a long-term convergence between Fintech measures and economic growth.

Adewuyi (2024) assessed the impact of FinTech on the economic development of developing countries, with a specific focus on Nigeria, to understand its contributions and identify areas for improvement. Data for this study was collected from the Central Bank of Nigeria, Macrotrends, and Statista, covering data from the past ten years, 2010 to 2020. Regression analysis was used in executing the data analysis. The selected FinTech services—ATM, PoS, and mobile payments—

showed a fluctuating but generally upward trend in production and popularity, peaking in 2020, likely due to the COVID-19 pandemic. Among these, ATMs were the most popular, although PoS and mobile payments have seen significant growth since 2017 and 2019, respectively. The study concludes that FinTech has a limited impact on GDP per capita, it significantly influences consumer price index and the unemployment rate, indicating its critical role in shaping Nigeria's economic landscape.

Menza, Jerene, and Oumer (2024) investigated the effect of financial technology (Fintech) for financial inclusion in Ethiopia during this digital economic era. For this purpose, secondary data was collected from nine commercial banks (panel units) from the year 2015 to 2020. The random effect model was applied to estimate the effect of explanatory variables on the variable of interest based on Hausman test results and after testing all possible assumptions of the model. Accordingly, the finding revealed that ATM, mobi banking, POS, and agent banking were found to have statistically significant positive effect on financial inclusion.

Ngeze and Seif (2024) used quantitative quarterly time series data from Tanzania from 2008 to 2022. The Augmented Dicky Fuler (ADF) is used for the stationarity test, Johansen Cointegrations for the hypothesis and Cointegrations test, VAR and VECM for testing both short-run and long-run causality relationships, and Granger Causality for testing variable causality. The Ordinary Least Squares (OLS) regression model is used for parameter estimation, modelling and significance testing. The results show that the model is statistically significant and the independent variables in the regression accounted for around 89% of the overall variation in GDP. Fintech variable subscriptions have a positive impact on Tanzania’s economic growth. Thus, unemployment in Tanzania may be alleviated by the growing sector of financial technology.

Tiony, and Yin (2024) examined the impact of financial technology (fin-tech) innovation on financial inclusion and economic growth in Kenya. The study aims to analyze how fin-tech innovations, such as mobile money, digital banking, and block chain technology, have enhanced financial inclusion; investigate the contributions of these fintech innovations to economic growth, particularly in terms of small and medium-sized enterprises (SMEs) development, job creation, and GDP growth; identify the challenges and barriers to the

widespread adoption and impact of fintech innovations; and provide policy recommendations to enhance the positive impacts of fintech on financial inclusion and economic growth. The findings reveal that fintech innovations have significantly improved financial inclusion in Kenya by increasing accessibility, affordability, and usage of financial services. Mobile money platforms like M-Pesa have been particularly effective in providing financial services to the unbanked population, while digital banking and blockchain technology also contribute to this trend, albeit to a lesser extent.

Lavrinenko, Cizo, Ignatjeva, Danilevica, and Krukowski (2023) examined the global fintech index and the financial development index, which characterize financial development in the EU countries, as well as the sub-indices of the Financial Development Index. The article applies frequency analysis and correlation analysis methods. A positive linear relationship between the Global Fintech Index and the Financial Markets Index sub-index, as well as its components Financial Markets Depth Index and Financial Markets Efficiency Index, has been identified. There is also a positive linear relationship between the Global FinTech Index and the Financial Institutions Depth Index, while a negative linear relationship has been identified between the Global FinTech Index and the Financial Institutions Access Index.

Ezie, Oniore, and Ajaegbu (2023) investigated the impact of financial technology on Nigeria's economic growth spanning 2012Q1 to 2022Q4. Using the Fully Modified Ordinary Least Squares (FMOLS) technique, the research focused on three aspects of fintech: Internet (Web) Transactions, Mobile Payment Transactions, and Instant Pay Transactions. The findings were enlightening. Web-based transactions showed a significant enhancement in Nigeria's economic growth. These transactions not only simplified banking processes but also bolstered economic activities, making financial services more accessible to a wider demographic. In addition, Mobile Payment Transactions significantly impacted economic growth, acting as catalysts in spurring both urban and rural economic activities and inclusivity. On the other hand, Instant Pay Transactions displayed a rather unexpected negative impact on economic growth within the study period. While they augmented financial fluidity, they exhibited a negative, yet statistically significant, impact on overall economic growth.

Akwam, Okaro, Okonkwo, Adigwe, and Ogbonna (2023) examined the effect of financial technology on economic growth of Sub-Saharan African economies from 2004-2021. Owing to findings that fintech evolutions does not comply with financial institution regulations and their engagement in regulatory arbitrage, the study attempts to ascertain the implication of financial technology components on economic growth rate of Sub-Saharan African economies. The study was anchored on Technology Acceptance Model (TAM). The findings showed that the number of ATM per 100,000 adults had significant relationship with GDPr for the Sub-Saharan African economies combined within the period under review. The number of mobile money accounts per 1000 adults also had a significant relationship with GDP for the Sub-Saharan African economies combined while the number of mobile money transactions per 100,000 adults (MMT)also showing a significant relationship that improved economic growth rate in the Sub-Saharan African economies. However, financial technology does not granger cause a significant change in the economic growth rate of Sub- Saharan African economies. The results revealed a strong significant relationship between financial technology and economic growth of Sub-Saharan African economies, while showing mixed results at individual level with financial technology having significant effect on Nigerian economic growth rate but showing insignificant effect on the economic growth rate of Kenya and South Africa.

Kunawangsih, Suparyati1, Curry, and Zakkiyah (2023) analyzed the impact of fintech, labor force, domestic investment, foreign direct investment, HDI, and export variables on economic growth. The data used is semester data per province from 2020 – 2021. The data is processed using panel data (pooling data). The results showed that Fintech, Labor Force, Foreign Direct Investment, HDI, and Exports had a significant positive effect on economic growth, while Domestic Investment was not significant.

Samuel, Prince, Edet, Manasseh, Daniel, Okanya, Mgbobi, and Onwumere (2023) aimed to expand the FinTech frontier by utilizing the direct measures of FinTech, such as automated teller machines, web pay, mobile banking, and point of sale with unbundle financial inclusion indicators to examine their individual degree of effect. We employed the ARDL model in estimating the individual effect and respective equations.

Findings revealed several vital insights: direct measures of FinTech positively influence financial inclusion and economic growth. Automated teller machines negatively influence economic growth and financial inclusion, due to high maintenance costs and security concerns, leading to closure of ATMs galleries both within and outside bank branches. This closure resulted in infrastructural deficits, which hindered inclusive financing of the growing banked populations. Individual financial inclusion indicators positively influence economic growth, while economic growth and usage index nexus was non-significant.

Song and Appiah-Otoo (2022) the impact of fintech and the sub measures of third-party payment, credit, and insurance on China's economic growth. By using a sample of 31 provinces in China and the instrumental variable generalized method of moments (IV–GMM) technique, the study established that fintech and the sub measures of third-party payment, credit, and insurance have a statistically significant positive effect on China's economic growth. Specifically, a 10% rise in fintech, third-party payment, credit, and insurance raises China's economic growth by 8%, 4%, 5%, and 16%, respectively. The eastern region has the highest growth effect of fintech. Moreover, Zhejiang province has the highest growth effect of fintech at the provincial level, and a unidirectional causality exists from third-party payment and credit to economic growth, and economic growth to insurance; a bidirectional causality exists between fintech and economic growth.

Kireyeva, Kredina, Vasa, and Satpayeva (2021) evaluated the impact of financial technologies on economic growth. Using an original method based on correlation analysis, the relationship of indicators in different periods is calculated with the use of the SPSS software. The data is collected for period of 2004-2019, during which the reviewed countries were actively developing and increasing their financial and technological capacities. Analysis results largely indicate an increase in the number of bank branches in many of the reviewed countries. They consider the correlation between economic growth (expressed by indicators such as GDP), financial technologies (number of ATMs, user access to internet, and number of users of mobile communications) and gender indicators. The conclusions show a correlation between economic growth and financial technologies.

Khiewngamdee and Yan (2019) investigated whether Fintech e-payment affects economic development in APEC countries, in particular, income growth, productivity, price volatility, and income inequality. We use e-payment index introduced by RMIT University and TRPC and apply quantile regression with GME approach. We consider the quantile level at 0.25, 0.50, and 0.75. At the low level of economic development variables, the Fintech have the highest effects on these variables compared with the medium and high level of economic development.

3. METHODOLOGY

An ex-post facto research design was used in this investigation. The data span between 2006 and 2022. The National Bureau of Statistics (NBS) and the Central Bank of Nigeria (CBN) provided the secondary data, which was updated annually. The Human Development Index (HDI) is the dependent variable. The independent variables are the financial technology services channels that Nigerian deposit money banks use, as measured by the volume of transactions on the four e-money products that are offered in Nigeria: Point of Sale (POS) terminals, Internet Banking (IBNK), Mobile Banking (MBNK), and Automated Teller Machines (ATM). The Auto-regressive Distributive Lag (ARDL) method was used to estimate the model.

The model of Iheji, Ezeanyeji, and Obi (2025) was adapted and modified in this work to produce the functional model as follows:

$$HDI = f(VATM, VMBNK, VIBNK, VPOS) \quad 3.1$$

When equ.3.1 is transformed econometrically, it results to thus:

$$LogHDI_t = \beta_0 + \beta_1 LogVATM_t + \beta_2 LogVMBNK_t + \beta_3 LogVIBNK_t + \beta_4 LogVPOS_t + \varepsilon_t \quad 3.2$$

Where:
PAL = Poverty Alleviation
VATM = Volume of transactions on automated teller machines
VMBNK = Volume of transactions on mobile banking platform
VIBNK = Volume of transactions on internet banking platform
VPOS = Volume of transactions on point of sale terminals
β_0 = a constant term
β_1, β_2, β_3 and β_4 are the coefficients of the regression equation
$\boldsymbol{\varepsilon}$ = the error term
t= the time trend

The parameters β_1–β_4 should ideally be greater than zero due to an a priori anticipation that β_1, β_2, β_3, and $\beta_4 > 0$. In other words, it was anticipated that the amount of business conducted by automated teller machines, internet, mobile, and point-of-sale terminals would positively correlate with Nigeria's human development index.

4. RESULTS AND DISCUSSION OF FINDINGS

Data Descriptive Features

The data set's mean, median, maximum, standard deviation, skewness, kurtosis, Jarque-Bera, p-value, and number of observations were all captured by the descriptive properties of the data. The means were 0.510000 for HDI, 523.4588 for VATM, 103.2041 for VMBNK, 140.5888 for VIBNK, and 111.6918 for VPOS, according to Table 4.1's descriptive properties of the data common sample. For PAL, VATM, VMBNK, VIBNK, and VPOS, the corresponding medians for the sample data are 2959.000, 400.1000, 27.70000, 7.200000, and 20.80000. HDI has a maximum of 0.54000 and a minimum of 0.480000, VATM has 1332.650 and 12.10000, VMBNK has 692.9500 and 0.410000, VIBNK has 1171.990 and 0.220000, and VPOS has 438.6000 and 0.400000. For HDI, VATM, VMBNK, VIBNK, and VPOS, the corresponding standard deviations are 0.024495, 421.4266, 184.1454, 336.1217, and 150.0537. The positive values of the skewness statistic demonstrated that the standard deviation variables were positively skewed towards normality. Because the p-values of the Jarque-Bera statistics have a 5% level of significance, the Jarque-Bera indicates that all of the variables are normally distributed.

Table 4.1: Data Descriptive Features

	HDI	VATM	VMBNK	VIBNK	VPOS
Mean	0.510000	523.4588	103.2041	140.5888	111.6918
Median	0.510000	400.1000	27.70000	7.200000	20.80000
Maximum	0.540000	1332.650	692.9500	1171.990	438.6000
Minimum	0.480000	12.10000	0.410000	0.220000	0.400000
Std. Dev.	0.024495	421.4266	184.1454	336.1217	150.0537
Skewness	-0.078902	0.526021	2.268869	2.442532	0.968423
Kurtosis	1.438802	2.136033	7.388312	7.303019	2.393049
Jarque-Bera	5.744088	11.31270	28.22591	30.01904	12.91817
Probability	0.008096	0.000040	0.000001	0.000000	0.000049
Sum	8.670000	8898.800	1754.470	2390.010	1898.760
Sum Sq. Dev.	0.009600	2841606.	542552.4	1807645.	360257.7
Observations	17	17	17	17	17

Source: E-views 12.0 version data output

Stationarity Test

At level form, the unit root test was run. The first difference estimation was required due to the extent of data non-stationarity at level. Table 4.2 displays the variables' ADF findings, whereas Table 4.3 displays the results of the PP tests. All of the variables were not stationary at level, according to the results of the ADF and PP unit root tests, but they all became stationary at the first difference of estimate using none, intercept, and trend and intercept. Since the data were steady overall, they were not subject to the stationarity flaw that most time series data have.

Table 4.2: Result of ADF Test at First Difference

Variables	Intercept	Trend & Intercept	None	Inference
HDI	-5.968745 (0.00)*	-6.321456 (0.00)*	-4.693256 (0.00)*	Stationary
VATM	-4.372399 (0.00)*	-4.828456 (0.00)*	-2.743729 (0.00)*	Stationary
VMBNK	-19.91849 (0.01)*	-3.958977 (0.04)**	-20.74443 (0.00)*	Stationary
VIBNK	-5.415214 (0.00)*	-4.373314 (0.00)*	-5.902810 (0.00)*	Stationary
VPOS	-4.203980 (0.00)*	-5.475291 (0.00)*	-3.079081 (0.00)*	Stationary

Source: E-views 12.0 version data output

Table 4.3: Result of PP Test at First Difference

Variables	Intercept	Trend & Intercept	None	Inference
HDI	-6.147852 (0.00)*	-9.369852 (0.00)*	-4.987456 (0.01)*	Stationary
VATM	-4.819135 (0.00)*	-7.210727 (0.00)*	-2.706651 (0.01)*	Stationary
VMBNK	-8.107232 (0.00)*	-12.60893 (0.00)*	-7.364550 (0.00)*	Stationary
VIBNK	-2.315211 (0.17)	-3.145461 (0.13)	-2.068014 (0.04)**	Stationary
VPOS	-2.407003 (0.15)	-2.469907 (0.33)	-2.364504 (0.02)**	Stationary

Source: E-views 12.0 version data output

ARDL Short-run Relationship

According to Table 4.4's results, there is a negligible inverse correlation between Nigeria's human development index, VMBNK, VIBNK, and VPOS transactions. Conversely, it was discovered that the value of ATM transactions had a negligible and positive correlation with Nigeria's human development index. The human development index in Nigeria depreciates by 3.09, 1.10, and 1.87 factors for every unit increase in VMBNK, VIBNK, and VPOS transactions. The opposite is true for the value of ATM transactions, as Table 4.4 indicates that a 1.84% rise in the value of ATM transactions would result in a 1.84% increase in Nigeria's human development index. With VATM, VMBNK, VIBNK, and VPOS held constant, the coefficient of the constant shows that Nigeria's human development index would be 79.89%. According to the adjusted R-square, variations in VATM, VMBNK, VIBNK, and VPOS transactions were responsible for roughly 94.92% of changes in Nigeria's human development index. According to the

f-statistic (57.00) and p-value (0.00), this is statistically significant. The Durbin Watsons' coefficient of 2.03 reveals that there is no element of autocorrelation in the estimated model.

Table 4.4: ARDL Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HDI(-1)	0.798923	0.199119	4.012289	0.0025
VATM	1.84E-05	1.45E-05	1.273364	0.2317
VMBNK	-3.09E-06	1.16E-05	-0.266345	0.7954
VIBNK	-1.10E-05	7.00E-06	-1.565007	0.1486
VPOS	-1.87E-06	1.82E-05	-0.102839	0.9201
C	0.097889	0.094775	1.032860	0.3260
R-squared	0.966104	Mean dependent var		0.511875
Adjusted R-squared	0.949155	S.D. dependent var		0.024005
S.E. of regression	0.005413	Akaike info criterion		-7.320076
Sum squared resid	0.000293	Schwarz criterion		-7.030355
Log likelihood	64.56061	Hannan-Quinn criter.		-7.305240
F-statistic	57.00325	Durbin-Watson stat		2.038843
Prob (F-statistic)	0.000001			

Source: E-views 12.0 version data output

Granger Causality Test

Granger causality analysis was used to ascertain how financial technology affected Nigeria's human development index. The volume of transactions on point-of-sale terminals, mobile banking, online banking, and ATMs has no discernible impact on Nigeria's human development index, according to the model output in Table 4.5. This is predicated on the finding that, at a significance level of 5%, there is no unidirectional causal association between transactions made on point-of-sale terminals, mobile banking, online banking, and ATMs and the human development index in Nigeria. In other words, during the study period, financial technology had no discernible impact on Nigeria's human development index. That notwithstanding, it was found that human development index has significant effect on volume of transactions on internet banking owing to the fact that a unidirectional causality flows from human development index to volume of transactions on internet banking at a significance level of 5%.

Table 4.5: Granger Causality Result

Null Hypothesis:	**Obs**	**F-Statistic**	**Prob.**	**Remarks**
VATM does not Granger Cause HDI	16	0.42180	0.5273	No Causality
HDI does not Granger Cause ATM		3.02406	0.1056	No Causality
VMBNK does not Granger Cause HDI	16	1.46785	0.2472	No Causality
HDI does not Granger Cause VMBNK		6.18576	0.0272	Causality
VIBNK does not Granger Cause HDI	16	0.60612	0.4502	No Causality

HDI does not Granger Cause VIBNK		2.28030	0.1549	No Causality
VPOS does not Granger Cause HDI	16	0.43975	0.5188	No Causality
HDI does not Granger Cause VPOS		3.57785	0.0810	No Causality

Source: E-views 12.0 version data output

According to the Granger causality result, the human development index was not significantly impacted by the financial technology's inducing impacts. This suggests that none of the financial technology channels have a major impact on Nigeria's human development index, which serves as a stand-in for assessing economic development in the country. This supports the work of Samuel, Prince, Edet, Manasseh, Daniel, Okanya, Mgbobi, and Onwumere (2023) aimed to expand the FinTech frontier by utilizing the direct measures of FinTech, such as automated teller machines negatively affect economic growth and financial inclusion, due to high maintenance costs and security concerns, leading to closure of ATMs galleries both within and outside bank branches. It is also in line with Chukwu, Akunna, and Anaike (2024) that financial technology variables of automated teller machines (ATM), point of sale (POS), internet banking, and mobile banking have no significant effect on Nigeria's human development index. On the contrary, it oppose the findings of Ngong, Thaddeus, and Onwumere (2024) which unveiled a bidirectional causality between automated teller machine and economic growth, with unidirectional causation from economic growth to point of sales and internet banking, mobile banking and government effectiveness to economic growth. The financial technology variables had a joint impact on Nigeria's human development index and had a very high explanatory power in terms of joint significance and model fitness. This means that the percentage of adoption of different financial technology channels was a major factor in the changes in both the human development index and FinTech adoption. Thus, there is compelling evidence that if financial technology is deeply ingrained in the Nigerian financial system, its adoption can raise the country's human development index.

5. CONCLUSION AND RECOMMENDATIONS

The needs of groups that have been either directly or indirectly excluded from formal financial institutions can now be met thanks to financial innovations. In nations where financial models centered on digital activities are used, agents and creative consumer education are employed to encourage low-income populations to embrace technology

with the express goal of advancing both economic development and inclusion. The study used an ex post facto research design, and the World Bank and Central Bank of Nigeria (CBN) provided carefully chosen secondary data. Using data from 2006 to 2022, the models were estimated using the Auto-Regressive Distributive Lag (ARDL) estimation technique and the Granger causality tests. The study revealed that there is an insignificant negative relationship between volume of mobile banking, internet banking, point of sale terminal transactions, and human development index in Nigeria. On the contrary, value of transactions on automated teller machine was found to have insignificantly and positively associated with human development index in Nigeria. Similarly, the granger causality result revealed that the inducing effects of financial technology were found to have no significant effect on human development index. To this end, this study concludes that financial technology has no significant effect on economic development in Nigeria.

Although financial technology has the potential to revolutionize Nigeria's economy, its full effects are still not being felt by many. Strengthening connectivity and infrastructure is necessary to realize this promise. The digital infrastructure is the foundation of financial technology. However, unstable energy and inadequate internet connectivity continue to plague many Nigerian rural and semi-urban communities. The government must give broadband internet, reliable electricity, and mobile network coverage top priority in order to increase access to financial technology services. By extending digital infrastructure to underserved locations, public-private partnerships can assist reach the 38% of Nigerians who do not have access to banking services. Additionally, encouraging digital skills and financial literacy would increase the role that financial technology plays in economic development. The use of financial technology is hampered by the lack of basic financial and digital literacy among many Nigerians, especially in rural areas. Governmental organizations should start national campaigns to inform the public about the safe use of digital financial tools in partnership with financial technology companies and non-governmental organizations (NGOs). Practical instruction in budgeting, fraud protection, mobile money, and smart borrowing should be part of this. A digital economy would also be better prepared for the next generation if financial education were incorporated into school curricula.

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