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ABSTRACT

This study investigates the determinants of financial inclusion in Nigeria. The study extends the empirical debate on the determinants of financial inclusion by focusing on the monetary policy and banking sector factors that influence the level of financial inclusion in Nigeria. The study employs the two-stage least squares regression method to estimate the determinants of financial inclusion in Nigeria during the 2007–2021 period. The results show that the central bank monetary policy rate, the savings deposit rate, and the loan to deposit ratio of banks are significant determinants of financial inclusion in Nigeria. Specifically, increase in the central bank interest rate decreases the level of financial inclusion, increase in the savings deposit rate increases the level of financial inclusion. These determinants are robust to alternative estimation using the quantile regression method. There is further evidence that the interbank lending rate, inflation rate and the nominal interest rate are also determinants of financial inclusion in Nigeria based on the two-stage least squares estimation.

Keywords: Financial inclusion, determinants, monetary policy, index, inflation, central bank, Nigeria, interest rate, savings, interbank lending

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1. Introduction

Financial inclusion is a process that brings everyone into the formal financial system so that everyone can have access to available formal financial services which they can use to improve their welfare (Barajas et al, 2020; Ozili, 2024). A World Bank 2021 Global Findex report shows that 1.7 billion people are unbanked or excluded from the formal financial system and a large majority of these people are in developing countries (Demirgüç-Kunt et al, 2022). This has led policy makers in developing countries to embrace financial inclusion as a top policy priority.

Despite financial inclusion being a top priority in developing countries, there are heated debates about the determinants of financial inclusion, with many studies suggesting that the determinants are mostly microeconomic factors and demand-side factors (Giday, 2023; Fahmy and Ghoneim, 2023; Barik and Lenka, 2023). Others argue that the determinants are mostly macroeconomic and supply side factors (Gebrehiwot and Makina, 2019; Markose et al, 2022; Matsebula and Sheefeni, 2022). The different perspectives or debates arise due to the multi-dimensional nature of financial inclusion and the unique challenges each country face on the path to financial inclusion (Prabhakar, 2019; Ozili, 2021b; Fernández-Olit et al, 2020).

Majority of the single country studies in the literature suggest that most of the determinants of financial inclusion are country specific. This is also true for Nigeria as existing studies suggest that financial literacy, gender, income, age, internet usage, access to credit and the level of poverty are some determinants of financial inclusion in Nigeria (see Adetunji and David-West, 2019; Ozili, 2021a; Eze and Markjackson, 2020; David et al, 2018; Ene et al, 2019). Despite this evidence documented in the literature, the current reality of financial inclusion in Nigeria remains very challenging.

Nigeria's level of banked-based financial inclusion is still very low despite the efforts of the government to accelerate financial inclusion since 2012 when the central bank issued the National Financial Inclusion Strategy and the revised version of the Strategy in 2018. In 2023, Nigeria recorded a 52 percent level of bank-based financial inclusion according to the 2023 Access to Finance EFInA report. This means that only 52 percent of Nigerians have a formal bank account. This indicates that only 110.9 million people have a bank account in Nigeria and 102.1 million people are unbanked out of a population of 213 million people. This huge number of unbanked people is a cause for serious concern for the monetary authority in Nigeria, and it has led the monetary authority to announce that it would look inwards and undertake a critical evaluation of the existing monetary policy framework and the structural factors in the banking sector to determine which aspects of the current monetary policy framework and banking sector factors are beneficial and detrimental to financial inclusion in Nigeria.

This calls for the need to re-examine the determinants of financial inclusion in Nigeria with particular focus on the monetary policy factors and the banking sector factors that affect the level of financial inclusion in Nigeria. Although existing studies have examined some determinants of financial inclusion in Nigeria (Eze and Markjackson, 2020; David et al, 2018; Ene et al, 2019), such studies did not extensively examine the monetary policy factors and banking sector factors that determine the level of financial inclusion in Nigeria. Existing studies did not consider the role of central bank interest rate or the interbank lending rate in influencing the level of financial inclusion in Nigeria, considering the fact that changes in interest rate can make financial services become more expensive and can discourage unbanked Nigerians from joining the formal financial sector.

This study contributes to the financial inclusion determinants literature (e.g., Prabhakar, 2019; Ozili, 2021b; Fernández-Olit et al, 2020; Gebrehiwot and Makina, 2019; Markose et al, 2022; Matsebula and Sheefeni, 2022). It extends the literature by focusing on the monetary policy factors that may influence the level of financial inclusion and to determine the effect in the context of a developing country. The present study also contributes to the literature that examine the banking factors that aid or inhibit progress towards financial inclusion. The present study shows that the savings deposit rate, the loan to deposit ratio and the interbank lending rate are crucial banking sector factors affecting the level of financial inclusion in Nigeria. This study is the first to document this evidence in the context of Nigeria. The present study also contributes to the methodological literature on financial inclusion. The present study contributes to the methodological literature on financial inclusion and to ensure that the results are robust and that the insights gained from the analysis are reliable.

The rest of the study is organised as follows. Section 2 presents the contextual framework and literature review. Section 3 presents the research methodology. Section 4 presents the empirical results while the conclusion of the study is reported in section 5.

2. Contextual framework and literature review

2.1. Contextual framework

The central bank of Nigeria (CBN) is the monetary authority in Nigeria, and it is also responsible for increasing the level of financial inclusion in Nigeria. The CBN uses the agent banking network, microfinance institutions, bank branch expansion, ATMs, mobile money operators, payment service banks, payment service providers, super agents and bank verification number (BVN) registration to promote financial inclusion in Nigeria (NFIS, 2018). CBN has made some progress in increasing financial inclusion in Nigeria. The COVID-19 pandemic also accelerated digital financial inclusion in Nigeria as many consumers and businesses had to shift from cash payments to digital payments which led to a spike in digital financial inclusion in Nigeria (Replace with: (Wezel and Ree, 2023). The 2021 Global Findex data¹ confirms the growing trend in financial inclusion and digital payments in Nigeria. The Global Findex data in figure 1 show that account ownership of any type increased to 45% in 2021 from 30% in 2011. Access to formal credit increased to 6% in 2021 from 2% in 2011. Use of digital payments declined to 34% in 2021 from 37% in 2011. Meanwhile, data from EFInA report a higher level of financial inclusion that is significantly different from the data reported in the World Bank's Global Findex data, and the difference is due to differences in the definition of financial inclusion. EFINA data report a 74% level of formal inclusion in 2023 (see figure 2), indicating that 165.6million people are formally included while 58.2 million people are formally excluded out of a population of 213.4 million people. The increase to 74% in 2023 from 56% in 2020 is due to the marginal growth in the banked population and major gains in the adoption of formal non-bank digital payment channels. Of the 74% level of formal inclusion, 52% are formally banked, 12% own a non-bank account, and 10% are informally included. In terms of demographics (see figure 3), people who are formally employed (99%), informally employed (68%), business owners (56%), educated (68%), rich (71%), live in urban areas (64%), and men (58) have a higher level of financial inclusion compared to adults who are women (47%), live in rural areas (38%), poor (27%), uneducated (16%) and farmers (36%). In terms of regional spread, the Northern states recorded high levels of financial exclusion with the North-East states having exclusion levels that are above the national average, particularly in Borno state where the level of financial exclusion is 75% as shown in figure 4.

¹ The World Bank 2021 Global Findex data reports financial inclusion indicators that are comparable across countries.

INSERT ANY TABLES / FIGS / PICTURES / ILLUSTRATIONS / TABLES HERE (or attach them in separate documents)



Figures & Tables

Source: World Bank Global Findex 2021.

Figure 2.	2023	Level	of Finar	ncial	Inclusion
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Banked	Other formal	Informal	Financially Excluded
52.0%	12.0%	10.0%	26.0%
58.3m	13.3m	10.7m	28.9m
Formally Included – 64%		•	ſ
Formally Included – 74%			100

Source: EFInA Access to Financial Services in Nigeria 2023



Figure 3. Demographic characteristics

Source: EFinA Access to Financial Services in Nigeria 2023

Figure 4. Financial Inclusion Mapping across Nigeria



2023 State Formal Financial Exclusion (% of adults)

Source: EFinA Access to Financial Services in Nigeria 2023

Despite the progress made so far, the level of financial inclusion in Nigeria is still low compared to the global average and the sub-Saharan African average, as shown in figure 5. Many factors are contributing to the low level of financial inclusion in Nigeria according to EFInA. The most cited factors are little/insufficient funds, followed by irregular income, high cost of financial services, long distance to a financial institution and limited access to financial access points especially in rural areas. The less cited factors are lack of adequate support infrastructure such as lack of internet connectivity, poor access to roads, lack of identity, and poor electricity infrastructure, while for communities with internet and electricity access, the challenge is lack of mobile devices.² For rural households that have mobile phones, the major challenge is often language barrier when mobile applications are configured in English language. For those who understand English language, the barrier they face is low financial literacy and little understanding of mobile financial apps. For individuals who would like to open formal accounts, one hurdle they face is the difficulty of obtaining a BVN/NIN³ identification number due to not having sufficient documentation. Given these challenges, the central bank continues to increase its monetary policy interest rate to combat high inflation. Increasing interest rate in times of high inflation can be detrimental to bank-led financial inclusion because it can decrease the level of financial inclusion in Nigeria. Therefore, it is important to understand and investigate how certain monetary policy actions of the central bank and bank-specific factors hinder or accelerate progress towards financial inclusion in Nigeria.

 $^{^2}$ Data from 2020 A2F shows that ownership of mobile phones (mostly feature phones) amongst the excluded was about 71%.

³ BVN – Bank verification number; NIN – National Identification Number





Source: World Bank Global Findex 2021.

2.2. Literature review

The literature categorize the determinants of financial inclusion into the demand side determinants and the supply side determinants of financial inclusion. The demand side determinants include age, education level, income, race, gender, marital status, etc. (see, for example, Giday, 2023; Fahmy and Ghoneim, 2023; Barik and Lenka, 2023). The supply side determinants include bank branches, ATMs, mobile money services, bank account ownership, etc. (see, for example, Barik and Lenka, 2023; Adil and Jalil, 2020; Markose et al, 2022). Financial inclusion determinants may also be classified into the micro-determinants and macro-determinants of financial inclusion. The micro-determinants of financial inclusion include internet usage, mobile phone ownership, digital literacy, informal finance, etc. (see, for example, Ezzahid and Elouaourti, 2021; Ghosh and Vinod, 2017; Tinta et al 2022). The macro determinants of financial inclusion include inflation, monetary policy, economic growth, financial development, etc. (see, for example, Gebrehiwot and Makina, 2019; Vo et al, 2019; Dabla-Norris et al, 2021). The present study is positioned within the literature that examine the supply-side determinants, and the macro-determinants of financial inclusion.

The literature has extensively examined the effect of financial inclusion on monetary policy, but very little research has been done on the effect of monetary policy on financial inclusion. For instance, Lapukeni (2015) examines the effect of financial inclusion on inflation. The author used inflation as a measure of monetary policy effectiveness. The author used granger causality tests and found some causality between financial inclusion and inflation. Jungo et al (2022) examined the impact of financial inclusion on monetary policy in Sub-Saharan Africa (SSA) countries and in Latin America and the Caribbean (LAC) countries. They found that monetary policy accelerates financial inclusion in both regions. They also found that there is reverse causality between financial inclusion and monetary policy in both SSA and LAC countries. They further found that financial inclusion increases the effectiveness of monetary policy in SSA countries, while financial inclusion improves the efficiency of monetary policy in LAC countries. Lenka and Bairwa (2016) examined the impact of financial inclusion on monetary policy (measured in terms of inflation) in the South Asian Association for Regional Cooperation (SAARC) countries from 2004 to 2013. The authors used principal component analysis (PCA) to construct a financial inclusion Index, and found that financial inclusion, exchange rate, and interest rate have a negative effect on inflation in SAARC countries. Mbutor and Uba (2013) examined the impact of financial inclusion on monetary policy in Nigeria. They argue that higher financial inclusion would improve the effectiveness of monetary policy through the opening of more bank branches. However, they found a result that did not support their argument. They found a negative relationship between financial inclusion and monetary policy. Ait Lahcen and Gomis-Porqueras (2021) proposed a monetary model with endogenous credit market participation to study the effect of financial inclusion on inequality and welfare. They found that monetary policy has distributional consequences for financial inclusion, and that a direct transfer to bank account holders will yield the highest welfare benefits for credit market participants. Anarfo et al (2019) assessed the relationship between monetary policy and financial inclusion in 48 sub-Saharan African economies from 1990 to 2014. They found a bi-causal relationship between monetary policy and financial inclusion, implying that monetary policy affects financial inclusion, and financial inclusion is also influenced by monetary policy.

Some studies have emerged focusing on Nigeria. A substantial part of this literature focus on the demand-side determinants of financial inclusion in Nigeria. For example, Adetunji and David-West (2019) used survey data of more than 22,000 respondents in Nigeria to investigate the determinants of financial inclusion in Nigeria. They found that financial literacy is a positive determinant of financial inclusion because financial literacy influences people's savings patterns with formal and informal financial institutions. Similarly, Abdu et al (2015) assessed the demand-side determinants of financial inclusion in Nigeria using the 2011 Global Findex dataset. They assessed the determinants from a

socioeconomic and demographic context and found that youthful age, better education, and high income are positive determinants of financial inclusion, while old age, being female and having low income are associated with financial exclusion. Ozili (2021a) also examined the determinants of financial inclusion in Nigeria using a descriptive analysis and showed that formal borrowing and savings are significant determinants of financial inclusion. Other Nigerian studies considered some monetary aggregates as determinants of financial inclusion. For example, Eze and Markjackson (2020) examined the financial inclusion determinants in Nigeria using data spanning from 2000 to 2018 and using the ordinary least square technique. They found that domestic credit to private sector, rural deposits to loans ratio and the lending interest rate have a significant positive impact on financial inclusion. David et al (2018) examined the determinants of financial inclusion in Nigeria from 1990 to 2016 and using time series data. They included some monetary aggregate variables into their model and found that GDP per capita, broad money, credit and internet usage have a significant positive effect on financial inclusion in Nigeria. Ene et al (2019) examined some determinants of financial inclusion in Nigeria in year 2011 and found that automated teller machines have an insignificant effect on financial inclusion while point-of-sale devices have a significant impact on financial inclusion in Nigeria.

While the above studies examined the determinants of financial inclusion from the demand-side factors. These studies did not extensively examine the monetary policy factors and bank-specific factors that determine the level of financial inclusion in Nigeria. Moreover, the existing studies that examine the effect of financial inclusion on monetary policy did not use the central bank interest rate or the interbank lending rate as indicators of monetary policy rather they used only the inflation rate which may be difficult for central banks to control. The present study fills these gaps in the literature by focusing on the case of Nigeria, and using multiple indicators of monetary policy to identify the salient monetary policy factors alongside other bank-specific factors that drive the level of financial inclusion in Nigeria.

3. Research Methodology

3.1. The sample

The study used Nigerian data collected from the World Bank's global financial development indicators (GFDI) and the world development indicators (WDI). The collected data spans from 2007 to 2021 which is a 15-year period. Ten variables were used for the study (see table 1 for description of the variables). The first three variables were used to develop a composite index of financial inclusion while the other seven variables are the determinants of financial inclusion for this study.

Table 1. Description of the variables						
Symbol	Variable Name	Description	Source			
ATT	ATMs per 100,000 adults	Number of ATMs per 100,000 adults.	GFDI			
AOT	Bank accounts per 1,000 adults	Number of depositors with commercial banks per 1,000 adults.	GFDI			
BRR	Bank branches per 100,000 adults	Number of commercial bank branches per 100,000 adults.	GFDI			
FID	Financial inclusion index	The index is derived from the principal component analysis of the three financial inclusion variables (i.e., ATT, AOT & BRR)	Author			
EFF	Bank cost to income ratio	Bank operating expenses divided by sum of net-interest and operating incomes	GFDI			
LDR	Bank credit to bank deposit ratio	Deposit money bank total credit divided by total deposits.	GFDI			
INF	Inflation rate	Inflation as measured by the annual growth rate of the GDP implicit deflator	WDI			
MPR	Monetary policy rate	Central bank's reference interest rate. The rate on which all other rates are anchored	CBN			
NIR	Nominal interest rate	Interest rate that takes into account the prevailing inflation rate	WDI			
SD	Savings deposit rate	The interest rate that is paid on the deposits in savings account in a bank	CBN			
IBR	Interbank lending rate	The interest rate at which banks lend from each other overnight	CBN			

Source: World Bank & Central Bank of Nigeria Statistics

3.2. Descriptive statistics and correlation

Table 2 shows that, on average, Nigeria had a double-digit monetary policy rate of 11.2% while the interbank lending rate is also a double-digit rate at 11.6% over the period examined. In contrast, the average annual savings deposit rate is very low at 2.9% and is too low to attract new depositors to bring their savings to the formal financial system. The average nominal interest rate is higher than the average annual inflation rate which suggests that loans will be costly for borrowers. The loan-to-deposit ratio and the efficiency ratio are high and above 50% which indicates that Nigerian banks do not give out many loans from the deposits they receive, and they are less cost efficient. In terms of

the correlation among the variables, table 3 shows that the MPR variable is significant and positively correlated with the FID variable. This result indicates that the monetary policy rate is positively correlated with financial inclusion in Nigeria. In contrast, the NIR and LDR variables are significant and negatively correlated with the FID variable. This result indicates that the nominal interest rate and the loan-to-deposit ratio are inversely correlated with financial inclusion in Nigeriated with financial inclusion in Nigeriated with financial inclusion in Nigeria. Meanwhile, the SD, INF, EFF, and IBR variables have an insignificant correlation with the FID variable.

Table 2. Descriptive statistics								
Statistic	FID	MPR	SD	NIR	INF	LDR	EFF	IBR
Mean	-0.264	11.243	2.945	15.757	8.234	72.618	78.137	11.586
Median	-0.265	12.000	3.224	16.172	9.543	71.895	61.369	11.862
Maximum	-0.252	14.000	4.129	18.866	16.342	103.355	202.041	22.954
Minimum	-0.277	6.083	1.433	11.358	0.686	53.887	51.148	4.016
Std. Dev.	0.006	2.419	0.921	1.759	3.818	16.086	47.038	4.413
Skewness	0.002	-0.795	-0.338	-0.904	-0.099	0.689	2.143	0.662
Observations	14	15	15	15	15	15	15	15

Source: Author's computation

Variables	FID	MPR	SD	NIR	INF	LDR	EFF	IBR
FID	1.000							
MPR	0.546**	1.000						
	(0.04)							
	. ,							
SD	0.151	0.608**	1.000					
	(0.61)	(0.02)						
	(/	()						
NIR	-0.624**	-0.296	0.206	1.000				
	(0.02)	(0.30)	(0.47)					
	(0.02)	(0.00)	(0.17)					
INF	0.224	-0.064	-0.097	-0.210	1.000			
	(0.44)	(0.82)	(0.73)	(0.47)				
	(0111)	(0.02)	(0170)	(0117)				
LDR	-0.761***	-0.336	0.270	0.435	-0.259	1.000		
	(0.00)	(0.23)	(0.35)	(0.11)	(0.37)			
	(0.00)	()	()	()	()			
FFF	-0.361	-0.838***	-0.275	0.515**	0.064	0.284	1.000	
	(0.21)	(0.00)	(0.33)	(0.05)	(0.82)	(0.32)		
	(0.21)	(0.00)	(0.00)	(0.00)	(0.02)	(0.02)		
IBR	-0.069	0.482*	0.298	0.183	-0.119	0.244	-0.440	1.000
.51	(0.81)	(0.08)	(0.29)	(0.52)	(0.68)	(0.40)	(0 11)	
	(0.01)	(0.00)	(0.23)	(0.52)	(0.00)	(0.40)	(0.11)	

Table 3. Correlation matrix for the dependent and independent variables

***, **, * represent statistical significance at the 1%, 5% and 10% levels.

Source: Author's computation

3.3. Model specification, estimation procedure and variables justification

The model used to estimate the determinants of financial inclusion is similar to the model used in previous single-country studies such as Bozkurt et al (2018), Eldomiaty et al (2020) and Rashdan and Eissa (2020). The baseline model, in equation 1 below, estimates the financial inclusion index as a function of bank cost to income ratio, bank total credit to bank total deposit ratio, inflation rate, monetary policy rate, savings deposit rate, nominal interest rate and interbank lending rate.

$$(FID)i,t = \beta 0 + \beta 1MPRi,t + \beta 2SDi,t + \beta 3NIRi,t + \beta 4INFi,t + \beta 5LDR2i,t + \beta 6EFFi,t + \beta 7IBRi,t + ei,t \dots Eq (1)$$

FID = financial inclusion index. EFF = bank cost to income ratio. LDR = bank credit to bank deposit ratio. INF = inflation rate. MPR = monetary policy rate. NIR = nominal interest rate. SD = savings deposit rate. IBR = interbank lending rate. Where i, t represents country and year. Eit is the error term.

The two stage least squares method is the method used to estimate the model. The two stage least squares regression method addresses potential endogeneity issues especially where the independent variables are correlated with the error term (Angrist and Imbens, 1995; Sheikhi et al, 2022). In an additional analysis, a robustness test was conducted using the quantile regression method which addresses outliers in the data and the potential for non-linearity with the predictor variables (Koenker, 2005). In the quantile regression estimations, the quantile was set at the 0.5 quantile (or 50th percentile). This means that 50 percent of the data points are less than the value of the median.

Regarding the variable justification, the financial inclusion index is the dependent variable. Many studies in the literature used a financial inclusion index due to the multi-dimensional nature of the financial inclusion indicators (Yorulmaz, 2018; Sethy, 2015; Yadav et al, 2021). INF is the inflation rate variable. The literature suggests that high inflation can make basic financial services become expensive for banked adults to afford and it has the potential to discourage unbanked adults from joining the formal sector if basic financial services are too costly (Neaime and Gaysset, 2018). Therefore, a negative relationship between the INF and

FID variables is anticipated. The EFF variable is the cost-to-income ratio of banks. It is commonly referred to as the efficiency ratio of banks. Banks with a high cost to income ratio will reduce their cost by decreasing their non-core banking activities which includes financial inclusion activities (Demirgüç-Kunt and Klapper, 2013). The decrease in financial inclusion activities may occur through the closure of some bank branches or the withdrawal of ATM machines in some locations, all of which will decrease the level of financial inclusion. Therefore, a negative relationship between the cost-to-income ratio and the level of financial inclusion is anticipated. The LDR variable is also a potential determinant of financial inclusion. It is the loan to deposit ratio of banks. A high LDR ratio suggests that banks are extending more credit to borrowers from the deposits they receive which is beneficial for financial inclusion as it will increase access to credit. Therefore, a positive relationship is anticipated between the LDR and FID variables. The MPR variable is the central bank monetary policy rate, or the central bank interest rate. When the central bank raises the MPR, financial institutions will respond by raising all interest rates because the MPR is the interest rate on which all other interest rates are anchored on. The increase in the MPR rate will lead to the tightening of financing conditions, it will make loans become more expensive, and it will lead to a decrease in loan supply (Ozili, 2023). It will reduce access to formal credit and will be detrimental to financial inclusion. Therefore, a negative relationship between the MPR and FID variable is anticipated. The SD variable is the savings deposit rate. A high interest rate paid on savings will motivate unbanked adults to bring their money to banks in the form of savings deposit so that they can take advantage of the attractive savings deposit rate (Bharadwaj and Suri, 2020). Therefore, a positive relationship between the SD and FID variables is anticipated. The IBR variable is the interest rate at which banks lend to themselves overnight. A high overnight lending rate will increase the cost of bank liquidity. Banks can mitigate this effect by accelerating their efforts to attract depositors to bring their deposit to banks so that the deposits can be a source of cheap liquidity for banks. Bank's effort to attract depositors, as a strategy to counter a high interbank rate, will lead to higher financial inclusion as it will lead to new depositors bringing their monies into banks. Therefore, a negative relationship between the IBR and FID variables is anticipated. The NIR variable is the nominal (market) interest rate. When the nominal rate increases, loans become expensive, borrowers will pay a premium to borrow via high interest rates. It will reduce access to credit, and it will be a setback for financial inclusion as many households will not be able to access and afford formal

credit due to a high nominal interest rate (Heng et al, 2021; Ozili, 2023). Therefore, a negative relationship between the NIR and FID variables is anticipated.

4. Empirical Results

4.1. Baseline result

This section presents the baseline empirical result for the determinants of financial inclusion in Nigeria. The two stage least squares result is reported in table 4.

The MPR variable is significant and negatively related to the FID variable. This result indicates that the monetary policy rate has a negative effect on financial inclusion in Nigeria.

The result implies that a high monetary policy rate would tighten financing conditions in the banking sector and motivate banks to reduce credit to formal borrowers. It will make access to formal credit more difficult for households and adversely affect financial inclusion. The result supports the findings of Ozili (2023) who show that monetary policy has a negative impact on financial inclusion in emerging markets. In terms of economic significance, the MPR coefficient is not economically significant because a unit increase in the monetary policy rate leads to a 0.01% decrease in financial inclusion.

The SD variable is significant and positively related to the FID variable. This result indicates that the saving deposit rate has a positive effect on financial inclusion in Nigeria. The result implies that a high savings deposit rate will attract adults to bring their monies into the banking system so that they can receive interest on their savings deposit, thereby increasing financial inclusion. The result is consistent with Chummun and Ojah (2016) who argue that aggregate savings, and the desire to increase savings, can enable financial inclusion in African economies. In terms of economic significance, the SD coefficient is not economically significant because a unit increase in the savings deposit rate leads to a 0.023% increase in financial inclusion.

The NIR variable is significant and negatively related to the FID variable. The result indicates that the nominal interest rate has a negative effect on financial inclusion in Nigeria. The result

implies that a high nominal interest rate will constrain access to credit by making loans become expensive, thereby discouraging individuals from accessing formal credit. This will have a detrimental impact on financial inclusion as unbanked adults will avoid joining the formal financial sector if formal credit is too costly. This result is consistent with Uddin et al (2017) and Heng et al (2021) who show that high inflation is injurious in financial inclusion. In terms of economic significance, the NIR coefficient is not economically significant because a unit increase in the nominal interest rate leads to a 0.005% decrease in financial inclusion.

The INF variable is significant and negatively related to the FID variable. This result indicates that a inflation rate has a negative effect on financial inclusion in Nigeria. The result implies that a high inflation rate makes financial services become costly and unaffordable for Nigerians and it will discourage unbanked individuals from joining the financial sector, thereby, becoming a setback for financial inclusion in Nigeria. This result is consistent with Evans (2016) who found that inflation has a significant effect on financial inclusion in Nigeria. In terms of economic significance, the INF coefficient is not economically significant because a unit increase in the inflation rate leads to a 0.001% decrease in financial inclusion.

The LDR variable is significant and negatively related to the FID variable. This result indicates that the loan-to-deposit rate has a negative effect on financial inclusion in Nigeria. The result implies that a high loan to deposit ratio is detrimental for financial inclusion in Nigeria. In terms of economic significance, the LDR coefficient is not economically significant because a unit increase in the loan to deposit ratio leads to a 0.001% decrease in financial inclusion.

The IBR variable is significant and positively related to the FID variable. This result indicates that the inter-bank lending rate has a positive effect on financial inclusion in Nigeria. The result implies that a high interbank lending rate will lead to increase in financial inclusion because a high interbank lending rate means that it will be costly for banks to borrow among themselves. Therefore, banks will increase their own efforts to attract a large number of depositors in order to receive cheap liquidity, in form of customer deposits, which will reduce the need to borrow from other banks. Their efforts to attract depositors will lead to higher financial inclusion for new depositors. In terms of economic significance, the IBR coefficient is not economically significant. A unit increase in the interbank lending rate leads to a 0.002% increase in financial inclusion. The EFF variable is positive but insignificant in relation to the

FID variable. The positive coefficient, although not significant, suggests that bank efficiency does not have a significant effect on financial inclusion in Nigeria.

Table 4. Two-stage	Table 4. Two-stage least squares regression for the determinants of financial inclusion (FID)							
Variables	Coefficient	t-statistic	Prob. value					
MPR	-0.014***	-7.38	0.000					
SD	0.023***	6.11	0.000					
NIR	-0.005***	-2.84	0.004					
INF	-0.001*	-1.74	0.081					
LDR	-0.001***	-6.41	0.000					
EFF	-0.0002	-1.53	0.127					
IBR	0.002***	3.21	0.000					
J-statistic	6.837							
Prob(J-statistic)	0.008							
***:	* represent statistical sig	nificance at the 1% and 10)% levels.					

Source: Author's computation

4.2. Sensitivity/Robustness tests

4.2.1. Quantile regression estimation

In this section, the results are re-estimated using the quantile regression estimation technique to address the issue of outliers in the data. The quantile regression estimates are robust against outliers in the dataset, and it is a suitable estimator to use when there is the potential for non-linearity in the relationship between the dependent and independent variables, as well as when the data are nonnormally distributed (Koenker, 2017; Huang et al, 2017). The quantile regression result for the determinants of financial inclusion in Nigeria is reported in table 5. The MPR variable remains negatively significant in relation to the FID variable. This indicates that the result is robust, and it confirms that monetary policy rate has a negative effect on financial inclusion in Nigeria. The SD variable also remains positively significant in relation to the FID variable in table 5. This indicates that the result is robust, and it confirms that the savings deposit rate has a positive effect on financial inclusion in Nigeria. The NIR variable is insignificant in relation to the FID variable. This indicates that the result in table 5 is not robust with the earlier result obtained in table 4. The INF variable is also insignificant in relation to the FID variable. This indicates that the result in table 5 is not robust with the earlier result in table 4. The LDR variable is also negatively significant in relation to the FID variable. This indicates that the loan-to-deposit rate has a negative effect on financial inclusion in Nigeria. The result in table 5 is robust with the earlier result in table 4. The EFF variable is insignificant in relation

to the FID variable. This indicates that the result in table 5 is not robust with the earlier result obtained in table 4. Also, the IBR variable is insignificant in relation to the FID variable. This indicates that the result in table 5 is not robust with the earlier result obtained in table 4.

Table 5. Quantile regression estimation for the determinants of financial inclusion (FID)						
Variables	Coefficient	t-statistic	Prob. value			
MPR	-0.015***	-4.25	0.004			
SD	0.019**	2.83	0.025			
NIR	-0.003	-0.600	0.567			
INF	-0.001	-0.82	0.439			
LDR	-0.001***	-4.19	0.004			
EFF	-0.0003	-1.19	0.272			
IBR	0.002	1.657	0.142			
Adjusted R ²	65.96					
***, **	represent statistical signi	ficance at the 1% and 5%	6 levels.			

Source: Author's computation

4.2.2. Granger causality test

Before conducting the granger causality test, it is important to first conduct a unit root test to check the stationarity of the time series data for the seven variables to avoid obtaining spurious causation. We use the Augmented Dickey-Fuller (ADF) unit root test to check for stationarity in the time series data for the three variables. The ADF unit root test is reported in table 6. The ADF test in table 6 shows that the time series data for the NIR and INF variables have p-values which are less than 5 percent. This indicates that the time series data for the NIR & INF variables do not have a unit root and are therefore stationary. As a result, we will not take the first difference of the time series data for the FID, MPR, SD, NIR EFF and IBR variables have p-values which are greater than 5 percent. This indicates that the time series data for the series data for the series data for the FID, MPR, SD, NIR EFF and IBR variables have p-values which are greater than 5 percent. This indicates that the time series data for these variables have a unit root and are therefore non-stationary. As a result, we will take the first difference of the time series data for these variables before conducting the Granger causality test. The Granger causality test in table 7 reports a p-value which is less than 0.05 for the MPR, SD, NIR, INF, LDR, EFF and IBR variables, indicating that there is no uni-directional or bidirectional causality between financial inclusion and its determinants.

	Table 6. Summary of Augmented Dickey-Fuller (ADF) Unit root test for the variables							
Time series	t-statistic	p-value	Decision rule: (If P>0.5, data has unit root and is	Remark				
data			non-stationary)					
FID	-0.805	0.7836	P>0.05; the data has a unit root	Data is non-stationary				
MPR	-1.554	0.4761	P>0.05; the data has a unit root	Data is non-stationary				
SD	-1.971	0.294	P>0.05; the data has a unit root	Data is non-stationary				
NIR	1.156	0.995	P>0.05; the data has a unit root	Data is non-stationary				
INF	-3.309	0.038	P<0.05; the data does not have a unit root	Data is stationary				
LDR	-3.540	0.026	P<0.05; the data does not have a unit root	Data is stationary				
EFF	-2.160	0.227	P>0.05; the data has a unit root	Data is non-stationary				
IBR	-2.782	0.086	P>0.05; the data has a unit root	Data is non-stationary				

Source: Author's computation

Table 7. Pairwise Granger Causality Tests

Lags: 2		•	-	
Null Hypothesis:	Obs	F-Statistic	Prob.	Decision rule
D(MPR) does not Granger Cause D(FID)	11	0.15567	0.8592	Prob>5%; No granger causality
D(FID) does not Granger Cause D(MPR)		0.79429	0.4943	Prob>5%; No granger causality
D(SD) does not Granger Cause D(FID)	11	1.67512	0.2642	Prob>5%; No granger causality
D(FID) does not Granger Cause D(SD)		2.26248	0.1853	Prob>5%; No granger causality
D(NIR) does not Granger Cause D(FID)	11	4.90637	0.0546	Prob>5%; No granger causality
D(FID) does not Granger Cause D(NIR)		4.77356	0.0575	Prob>5%; No granger causality
INF does not Granger Cause D(FID)	11	1.36020	0.3257	Prob>5%; No granger causality
D(FID) does not Granger Cause INF		0.04645	0.9550	Prob>5%; No granger causality
LDR does not Granger Cause D(FID)	11	0.22694	0.8035	Prob>5%; No granger causality
D(FID) does not Granger Cause LDR		0.23342	0.7987	Prob>5%; No granger causality
D(EFF) does not Granger Cause D(FID)	11	0.06896	0.9341	Prob>5%; No granger causality
D(FID) does not Granger Cause D(EFF)		1.08572	0.3959	Prob>5%; No granger causality
D(IBR) does not Granger Cause D(FID)	11	0.80877	0.4887	Prob>5%; No granger causality
D(FID) does not Granger Cause D(IBR)		0.69416	0.5356	Prob>5%; No granger causality
D(NIR) does not Granger Cause D(MPR)	12	3.57605	0.0851	Prob>5%; No granger causality
D(MPR) does not Granger Cause D(NIR)		3.00877	0.1140	Prob>5%; No granger causality

Source: Author's computation

5. Conclusion

Financial inclusion can contribute immensely to human wellbeing and economic development in Nigeria if appropriate financial inclusion strategies are developed and implemented. Presently, the central bank of Nigeria and deposit money banks are collaborating to accelerate financial inclusion in Nigeria. The current reality in Nigeria is that certain monetary policy actions of the central bank and bank-specific factors may help to accelerate or hinder progress towards greater financial inclusion. My curiosity on this issue led me to investigate the monetary policy and bank-specific factors that affect financial inclusion in Nigeria. Data were analysed for 15 years from 2007 to 2021. The results showed that the central bank monetary policy rate, the savings deposit rate, and the loan to deposit ratio of banks are significant determinants of financial inclusion in Nigeria. These determinants are robust to alternative estimation using the quantile regression method. There is some evidence that the interbank lending rate, inflation rate and the nominal interest rate are also determinants of financial inclusion in Nigeria based on the two-stage least squares estimation.

Based on these findings, it is recommended that the monetary authority, or the central bank of Nigeria, should accelerate financial inclusion for the entire population by taking monetary policy actions that are not injurious or too burdensome on banks so that banks can be motivated to increase access and use of banking services for members of the population. This can be done by decreasing the monetary policy rate and decreasing the nominal interest rate so that the financial services offered by banks will be affordable to everyone, thereby attracting members of the population to join the formal financial sector. The central bank should also require banks to raise the savings deposit rate to attract unbanked adults who are willing to bring their money into the formal financial system.

The findings stress the importance of finetuning monetary policies to ensure that it does not place obstacles for banks and lead to the exclusion of many people from the formal financial system. It is also recommended that the central bank should increase its effort to reduce the rate of inflation as it was shown in the study that inflation adversely affects financial inclusion. The central bank should use an effective inflation targeting framework to reduce inflation so that financial services will become cheaper and easily accessible to the population. This will encourage more people to join the formal financial sector. Finally, it is recommended that the central bank and deposit money banks should collaborate and develop a progressive approach that would increase banks' capacity to accelerate financial inclusion in Nigeria. Such progressive approach may include opening more bank branches, providing more ATMs and opening more bank accounts.

The study has few limitations. The study used country-level industry data to investigate the determinants of financial inclusion in Nigeria and this data offered some interesting insights. The study did not use bank-level data of the 33 deposit money banks in Nigeria. Using bank-level data may provide additional insights. Another limitation of the study is the 15-year sample period. The sample period could be longer. The short period examined in the study was due to data unavailability.

This research presents plentiful opportunities for future research. For example, future studies can assess the fiscal policy factors affecting financial inclusion to determine whether factors such as government social welfare transfers, unemployment compensation payments and tax payments can lead to higher financial inclusion in Nigeria. Further research can also examine other macro financial determinants of financial inclusion such as aggregate tax rate, private credit to GDP ratio, and the level of financial stability, among others. There is also a need to compare the determinants of financial inclusion in Nigeria with that of other emerging economies such as Brazil and Argentia. Such studies would provide insights on the areas where Nigeria is doing better or poorly in comparison with emerging economies.

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