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The Role of Agency Banking and Mobile Money in Promoting Financial Inclusion in Apa Local Government Area (LGA) of Benue State

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Abstract
Financial exclusion remains a persistent challenge in rural Nigeria, where limited conventional banking infrastructure constrains economic participation. This study assesses the role of agency banking and mobile money in promoting financial inclusion in Apa Local Government Area (LGA) of Benue State – a predominantly agrarian region marked by limited traditional banking access and high poverty levels. Grounded in Institutional Theory, Agency Theory, Diffusion of Innovation Theory, and the Technology Acceptance Model, the study employs primary data from 500 adult residents selected through multi-stage sampling. Cronbach's alpha values exceeded the 0.70 threshold across all questionnaire sections, confirming high reliability. Composite indices were constructed for financial inclusion, agency banking utilization, mobile money adoption, and infrastructure access. Bootstrapped linear regression addressed potential normality violations and multicollinearity concerns, with digital financial Index (DFI) specified as a shared construct underlying agency banking and mobile money utilization. Results reveal a strong, statistically significant positive relationship between digital financial services adoption and financial inclusion. Most socio-demographic and infrastructural controls showed limited independent effects, suggesting that digital finance neutralizes traditional demographic barriers. The findings demonstrate that digital financial channels represent the primary pathway for expanding financial access in underserved rural areas. Policy implications include expanding agent banking networks, implementing supportive regulatory frameworks, improving digital infrastructure, and targeting financial literacy initiatives to enhance inclusive financial participation. The study contributes empirical evidence to the financial inclusion literature by demonstrating the dominant role of digital financial services in bridging rural financial access gaps.

Keywords: Financial inclusion, agency banking, mobile money, digital finance,

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1. Introduction

Financial inclusion means ensuring fair access to essential and affordable financial services for individuals and businesses, including transactions, savings, payments, credit, and insurance, provided in a responsible and sustainable manner (Demirgüç-Kunt, Klapper, Singer, Ansar & Hess, 2018)). Recognized as a global priority in the early 2000s, financial inclusion has been recognized by the World Bank as instrumental in achieving seven of the seventeen Sustainable Development Goals, particularly in reducing extreme poverty and fostering economic prosperity (Demirgüç-Kunt, et al., 2022). The G20 has reinforced this commitment by adopting principles to advance digital financial inclusion worldwide (Demirgüç-Kunt, et al., 2022). International efforts have been bolstered by organizations like the Consultative Group to Assist the Poor (CGAP), the Alliance for Financial Inclusion (AFI), and the Bill & Melinda Gates Foundation, which work to expand financial access for vulnerable populations (Koh, Phoon, & Ha, 2017).

Globally, financial exclusion remains acute in rural Africa, where formal bank account ownership varies from 11% in Central Africa to 51% in Southern Africa (Demirgüç-Kunt, et al., 2018). In Nigeria, exclusion persists due to urban-centric financial services, with rural areas facing additional challenges such as limited electricity access (Quadri et al., 2024). Klapper, Singer, Ansar and Hess (2019) reported that 41.6% of Nigerian adults (73.2 million) remain unbanked. Although the Central Bank of Nigeria's 2012 National Financial Inclusion Strategy aimed for 20% exclusion by 2020, only 64% inclusion was achieved by 2020, hampered by economic instability, security concerns, low literacy, and distrust in financial institutions (EFInA, 2021; CBN, 2022).

In response, the CBN's 2022 review highlighted agent banking and mobile money as key drivers of inclusion (Quadri et al., 2024). Agent banking, where regulated third parties deliver financial services, has expanded through fintech firms like OPay, TeamApt, and Paga, alongside telecom operators such as MTN and Airtel (Buchi, 2022; CBN, 2013). The revised 2021 regulations mandate stricter licensing and interoperability standards to spur growth (Quadri et al., 2024). Further measures include Payment Service Banks in 2018 and the Shared Agent Network Expansion Facility in 2019, which expanded agent networks to 1.5 million by 2023, though challenges like low income and financial literacy persist (Dollar & Huang, 2022). Research underscores the transformative potential of these innovations. Munyegera and Matsumoto (2014) highlight their role in bridging service gaps for rural communities, while Jack and Suri (2014) emphasize their capacity to mitigate economic shocks. Mobile money also streamlines aid distribution (Aker et al., 2011) and fosters access to formal financial products (Mas, 2010). As Nigeria targets 95% inclusion by 2024, this study evaluates the impact of agency banking and mobile money on financial inclusion and economic activity within Apa LGA, Benue State- a region with limited banking infrastructure.

Despite gradual improvements, Nigeria remains below its financial inclusion targets, particularly regarding the adoption of agency banking and mobile money services. Financial exclusion continues to disproportionately affect rural residents, youth, and low-income populations due to persistent barriers such as high service costs, documentation requirements, limited banking infrastructure, low financial literacy, and distrust in financial institutions. Operational challenges including POS transaction failures, regulatory constraints on telecom-led mobile money models and infrastructural limitations have further slowed progress despite increased interest in digital finance following the COVID-19 pandemic. Consequently,

empirical evidence on the effectiveness of these digital financial channels in rural Nigerian contexts remains limited. Against this backdrop, this study examines the impact of agency banking utilization and mobile money adoption on financial inclusion among rural households in Apa Local Government Area of Benue State, Nigeria, while also assessing how socioeconomic, demographic, and infrastructural factors shape financial inclusion outcomes in the study area.

2.1 Conceptual Clarifications

2.1.1 Agency Banking

Agency banking is a financial service delivery model whereby regulated third party entities, such as retail shops, pharmacies, or individual agents, provide banking services on behalf of licensed financial institutions (Bold, 2011; AFI, 2013). This model enhances financial inclusion by extending access to essential banking services—including cash deposits and withdrawals, fund transfers, bill payments, and account inquiries—to underserved or remote communities, thereby reducing operational costs for banks and generating income opportunities for local entrepreneurs (Mas & Siedek, 2008; Kumar, McKay, & Rotman, 2010). In Nigeria, the Central Bank's 2013 agent banking guidelines recognize both bank-led and non-bank-led models, the latter allowing fintech firms and mobile money operators to establish agent networks (CBN, 2013). Agency banking is particularly relevant in rural contexts such as Apa LGA, where limited branch infrastructure and socio-cultural barriers constrain access to formal financial services. By leveraging existing retail infrastructure and providing convenient, culturally appropriate services, agency banking has been shown to facilitate financial inclusion while supporting local economic activity (Sanusi, 2018; Adelakun, 2019). Challenges remain, including liquidity management, technological infrastructure, and regulatory compliance, but the model represents a cost-effective, scalable pathway to bridging the rural financial inclusion gap.

2.1.2 Mobile Money

Mobile money refers to financial services accessed via mobile devices, allowing users to store, send, and receive funds without a conventional bank account (Demirgüç-Kunt, Klapper, Singer, & Ansar, 2022; Jack & Suri, 2014). It supports person-to-person transfers, bill payments, airtime purchases, savings, and, in advanced implementations, credit and insurance products (Cook & McKay, 2015). Mobile money enhances financial inclusion by reducing transaction costs, providing convenient access to financial services, and enabling previously unbanked populations to participate in the formal financial system (Mbiti & Weil, 2013; Suri & Jack, 2016). In rural areas like Apa LGA, mobile money's reliance on widespread mobile penetration, simplified interfaces, and community-based agents mitigates barriers such as distance to banks and low financial literacy, offering culturally and linguistically appropriate financial solutions (Aker & Mbiti, 2010; Morawczynski & Pickens, 2009). Effective adoption, however, depends on supportive regulatory frameworks, investment in digital infrastructure, financial education, and continuous innovation in product design.

2.1.3 Financial Inclusion

Financial inclusion is broadly defined as the provision and active use of affordable, accessible, and quality financial services—such as deposits, credit, insurance, and payments by individuals and businesses to meet their needs (Sarma, 2008; Hanning & Jansen, 2010; AFI, 2013; CBN, 2018). It encompasses both access (the availability of services) and usage (actual participation in financial activities), acknowledging that mere access does not guarantee inclusion (GFDR, 2014). Financial inclusion facilitates savings accumulation,

investment, risk management, and efficient transfer of social benefits, and is strongly linked to poverty reduction and sustainable economic growth (Subbarao, 2009). For this study, financial inclusion is operationalized as the household-level ability to access and use formal financial services including loans, deposits, and insurance—at an affordable cost in a fair and transparent manner, measured via a composite financial inclusion index.

2.2 Theoretical Foundations

This study is anchored in four complementary theories that collectively explain rural financial inclusion through agency banking and mobile money adoption: First, Agency Theory (Jensen & Meckling, 1976; Eisenhardt, 1989) examines principal–agent relationships, highlighting conflicts arising from information asymmetry and divergent goals. In agency banking, financial institutions (principals) delegate service delivery to retail agents, creating potential for opportunism, fraud, and service gaps. Governance mechanisms monitoring, incentives, contracts, and trust-building mitigate these risks, ensuring service quality and sustainability (Mas & Siedek, 2008; Kumar et al., 2010). Empirical studies in Africa show that effective agent management and incentives are critical for financial inclusion outcomes (Mwende & Letting, 2015; Balogun & Afolabi, 2019).

Second, Diffusion of Innovation Theory (Rogers, 1962; 2003) explains how innovations spread through social systems. Adoption is influenced by innovation attributes—relative advantage, compatibility, complexity, trialability, and observability—alongside adopter categories and communication channels. Rural adoption of agency banking and mobile money is shaped by trust networks, local norms, peer influence, and demonstrable benefits, particularly in geographically dispersed communities (Jack & Suri, 2014; Mbiti & Weil, 2013; Munyegera & Matsumoto, 2016).

Third, Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh & Davis, 2000) focuses on individual adoption of technology, emphasizing perceived usefulness, ease of use, and trust. In rural contexts, these factors determine the likelihood of engaging with digital financial services, with social influence and facilitating conditions moderating adoption (Gefen et al., 2003; Adewoye & Oni, 2018).

Fourth, Institutional Theory (DiMaggio & Powell, 1983; Scott, 2008) highlights how formal rules, normative pressures, and cultural-cognitive structures shape organizational practices. In Nigeria, agency banking and mobile money operate within a regulatory environment governed by the Central Bank of Nigeria, complemented by informal institutions such as community norms, trust networks, and local financial practices (Ozili, 2020; Senyo & Osabutey, 2020). Institutional alignment affects service delivery, legitimacy, and adoption.

Collectively, these theories provide a multi-level lens linking institutional context, organizational relationships, innovation diffusion, and individual adoption behaviour, crucial for understanding financial inclusion in rural Nigeria.

2.3 Empirical Review

Empirical studies demonstrate the role of agency banking in enhancing financial inclusion, particularly in rural and underserved contexts. In Nigeria, Agbor et al. (2023) found that POS terminals improved access to basic financial services but had limited impact on new account ownership, highlighting the importance of perceived usefulness and ease of use. Similarly, Okore and Ugwuanyi (2022) reported that agency banking increased access, convenience, and cost efficiency, though challenges persisted in agent liquidity, security, and awareness.

Localized evidence from Benue State indicates that agent banking supports poverty reduction, employment, and economic activity (Akighir et al., 2020; 2022), while studies in Kwara State and Uganda confirm that agent network expansion, transaction activity, and technological support positively influence rural financial inclusion (Abdullahi et al., 2020; Arineitwe & Kabanda, 2025). Cross-country and African studies suggest that effective agent management, commitment, and supportive institutional environments enhance service delivery (Gupta & Singh, 2023; Ouma et al., 2017). However, most studies are limited by narrow focus on supply-side metrics, cross-sectional designs, single-bank contexts, or lack of attention to demand-side factors such as trust, adoption behaviour, and usage depth. The present study addresses these gaps by integrating supply- and demand-side perspectives, focusing on Apa LGA, and examining multiple dimensions of financial inclusion (access, usage, quality).

Mobile money has been shown to significantly improve financial access, transaction convenience, and income-smoothing in rural settings. In Kenya, M-Pesa adoption increased household risk-sharing, remittances, and consumption smoothing (Jack & Suri, 2014; Mbiti & Weil, 2013). In Uganda, mobile money facilitated remittance flows and household welfare, particularly for agriculture-dependent households (Munyegera & Matsumoto, 2016). Cross-country evidence shows that regulatory enabling environments drive mobile money uptake, especially among women and low-income groups (Agarwal & Assenova, 2023). In Ghana and Nigeria, agent credibility, service quality, ease of use, and perceived usefulness significantly influenced mobile money adoption and sustained usage (Shaikh et al., 2023; Siano et al., 2020; Grzybowski et al., 2023). Despite these positive outcomes, studies often overlook local heterogeneity, rural adoption barriers, trust, social networks, and integration with existing financial systems. For Nigeria, macro-level analyses suggest limited adoption and weak linkages with bank performance (Ihenachor & Ozegbe, 2020), emphasizing the need for micro-level, rural-focused research that combines agency banking and mobile money.

Current literature exhibits several gaps: (i) limited rural-focused, Nigeria-specific evidence jointly examining agency banking and mobile money; (ii) emphasis on access over usage quality and depth; (iii) inadequate integration of multi-level theoretical frameworks linking institutional context, organizational relationships, community diffusion, and individual adoption; and (iv) under-exploration of trust, social networks, and local norms in adoption dynamics. The present study addresses these gaps by providing primary, rural-focused evidence from Apa LGA, adopting a multi-theoretical, mixed-methods approach, and analyzing agency banking and mobile money jointly across multiple dimensions of financial inclusion. This approach enables a deeper understanding of adoption, usage, and institutional, technological, and behavioural factors, providing actionable insights for policy and practice.

3. Methodology

This study employs a quantitative cross-sectional design to investigate the impact of agency banking utilization and mobile money adoption on financial inclusion among rural households in Apa Local Government Area, Benue State, Nigeria. Primary data were collected via structured questionnaires, capturing indicators of financial service access, usage, and quality, as well as household socio-economic and infrastructural characteristics. Respondents were selected through a multistage sampling procedure to ensure representativeness across communities. Control variables such as age, gender, education, income and occupation were measured directly using structured questionnaire responses. However, multidimensional constructs such as digital literacy and infrastructure access,

agency banking utilization and mobile money awareness were operationalized as composite indices derived from transforming variables by taking the mean values of each of the variables. Each indicator was coded using Likert or binary scales, standardized to eliminate measurement bias, and averaged to form respective indices. Data analysis combines descriptive and inferential statistical techniques. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarize respondent characteristics and patterns of financial service usage, while inferential analysis evaluates the determinants of financial inclusion. To empirically assess these relationships, the study specifies a multiple regression model in which the financial inclusion index serves as the dependent variable, while agency banking utilization index, mobile money adoption index, and a vector of socio-economic and infrastructural control variables constitute the explanatory factors. The empirical model is expressed as:

$$FI_i = \beta_0 + \beta_1 AB_i + \beta_2 MM_i + \beta_3 CV_i + \varepsilon_i \quad - - - - - - \quad (1)$$

Where FI_i denotes the financial inclusion index for household i, AB_i represents the agency banking utilization index, MM_i is the mobile money adoption index, CV_i is a vector of control variables, β_0 is the intercept, β_1–β_3 are slope coefficients, and ε_i is the stochastic error term. The model allows estimation of the magnitude and direction of effects while accounting for potential confounders. Statistical significance is evaluated at the 5% level. To address multicollinearity observed between agency banking utilization and mobile money adoption, the model was re-specified by constructing a composite Digital Financial Inclusion (DFI) index capturing the shared variance of both channels. This approach enhances coefficient stability while reflecting the complementary role of digital financial service platforms in promoting financial inclusion. Hence, the model is respecified as:

$$FI_i = \beta_0 + \beta_1 DFI_i + \beta_2 CV_i + \varepsilon_i \quad - - - - - - - \quad (2)$$

Where DFI represents the shared construct underlying AB and MM.

To enhance statistical reliability and account for potential heteroskedasticity, robust standard errors were estimated using bootstrapping procedures within SPSS. Instrument validity was ensured through expert review and pilot testing, while reliability was assessed via Cronbach's alpha and other internal consistency measures. Ethical protocols adhered to international standards, including voluntary participation, informed consent, anonymity, and secure handling of data.

4. Results and Discussion

4.1 Reliability Test

Table 4.1: Cronbach's Alpha Reliability Test Result

Sections	No of Items	Cronbach's Alpha	Remark
Section B	5	.964	Reliable
Section C	8	.990	Reliable
Section D	7	.988	Reliable
Section E	7	.990	Reliable

Source: *Author's computation using SPSS 27*

As shown in table 4.1, the reliability analysis indicates very high internal consistency across all questionnaire sections, with Cronbach's alpha values ranging from 0.964 to 0.990. These values exceed the conventional 0.70 threshold, confirming that the measurement scales are highly reliable and suitable for subsequent statistical analysis. However, alpha values

approaching unity may suggest item redundancy, implying that some items may be measuring very similar aspects of the constructs. Nonetheless, given the theoretical grounding of the constructs, the scales are considered sufficiently reliable for empirical modeling and inference.

4.2 Descriptive Statistics

Table 4.2: Summary of Descriptive Statistics Result

Variables	Number	Mean	Std. Dev	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
Age	459	2.81	1.071	.147	.114	-.489	.227
Gender	459	1.65	.478	-.617	.114	-1.626	.227
Educational Level	459	1.61	.925	-.254	.114	-.762	.227
Monthly Income	459	2.04	.834	1.149	.114	1.936	.227
Occupation	459	4.60	1.593	-.793	.114	-.822	.227
Infr	459	3.16	1.233	-.416	.114	-1.076	.227
FI	459	3.75	1.303	-.894	.114	-.591	.227
AB	459	3.88	1.161	-1.054	.114	.145	.227
MM	459	3.89	1.245	-1.065	.114	-.049	.227
Valid Number	459						

Source: *Author's computation using SPSS 27*

The descriptive statistics in table 4.2 are based on 459 valid observations, indicating a sufficiently large sample for robust statistical analysis. Mean values suggest moderate variation in respondents' socio-economic characteristics and relatively positive perceptions of financial inclusion and digital financial services. The mean age score (M = 2.81, SD = 1.071) indicates that respondents are largely concentrated within the middle age categories. Gender distribution (M = 1.65, SD = 0.478) reflects a slight dominance of one coded gender category. Educational level (M = 1.61, SD = 0.925) suggests respondents generally possess at least basic formal education, while income (M = 2.04, SD = 0.834) indicates moderate income levels. Occupation shows greater variability (M = 4.60, SD = 1.593), implying diverse livelihood activities.

Furthermore, infrastructure access (Infr: M = 3.16, SD = 1.233) suggests moderate availability of digital and financial service infrastructure. The financial inclusion index (FI: M = 3.75, SD= 1.303) indicates relatively positive access, usage, and perception of financial services among respondents. Agency banking utilization (AB: M = 3.88, SD = 1.161) and mobile money adoption (MM: M = 3.89, SD = 1.245) both show relatively high mean scores, suggesting substantial uptake of alternative financial service channels in the study area. Skewness values indicate slight asymmetry across variables. Monthly income is positively skewed (1.149), implying more respondents fall within lower income categories. Most other variables show mild negative skewness, suggesting concentration toward higher response categories. Kurtosis values generally fall within acceptable bounds, indicating no severe departures from normal distribution despite some flattening or peaking in specific variables. Over all, the results suggest moderate socio-economic diversity, reasonably good infrastructure access, and comparatively strong adoption of agency banking and mobile money services, supporting their potential role in enhancing financial inclusion within the study context.

4.3 Mean Ratings and Standard Deviation of Individual Items of the Respondents

Table 4.3: Mean Ratings and Standard Deviation of Respondents Result

S/N	Items	Mean	Std. Dev
	Section A: Socio-Demographic Characteristics of the Respondents		
1	Age	2.81	1.071
2	Gender	1.65	.478
3	Educational level	1.61	.925
3	Monthly income	2.04	.834
5	Occupation	4.60	1.593
	Section B:Technology and Infrastructure		
1	I own a smartphone	3.38	1.543
2	Bank agents or mobile money operators are available in my area	3.86	1.379
3	I have adequate digital literacy to use financial technology services	3.56	1.275
4	Internet network service is reliable in my area	3.21	1.332
5	I have stable access to electricity	1.78	1.013
	Section C: Financial Inclusion		
1	I have easy access to formal financial services	3.58	1.406
2	services are readily available when I need them	3.66	1.395
3	I regularly use formal financial services for my transactions	4.32	1.126
4	Using financial services has become part of my daily financial activities	3.84	1.216
5	Financial services available to me are convenient to use	3.75	1.474
6	I find financial services affordable	3.64	1.237
7	I trust financial service providers in my area	3.80	1.524
8	Overall, I feel financially included through available services	3.39	1.357
	Section D: Agency Banking Utilization		
1	Agency banking outlets are easily accessible to me	4.00	1.168
2	I frequently use agency banking services for transactions	4.07	1.138
3	Agency banking saves me time compared to visiting bank branches	4.06	1.028
4	Agency banking services are reliable	3.44	1.306
5	Agency banking services are affordable	4.03	1.237
6	Agency banking makes financial transactions easier for me	3.88	1.257
7	Overall, agency banking improves my access to financial services	3.66	1.265
	Section E: Mobile Money Adoption		
1	I regularly use mobile money for financial transactions	3.96	1.269
2	Mobile money services are convenient for my financial needs	3.67	1.368
3	Mobile money transactions are reliable	3.82	1.264
4	Mobile money services are affordable	3.63	1.409
5	Mobile money has made financial transactions easier for me	3.97	1.335
6	I feel confident using mobile money services	4.20	1.085
7	Overall, mobile money improves my access to financial services	3.97	1.210

Source: *Author's computation using SPSS 27*

The mean ratings presented in table 4.3 provide insights into respondents' socio-demographic characteristics, technological environment, financial inclusion status, and adoption of agency banking and mobile money services. Overall, mean scores above the mid-point (≈3 on a 5-point scale) suggest general agreement with the statements, while standard deviations indicate moderate variability across respondents.

The mean age score (M = 2.81, SD = 1.071) indicates respondents were largely within the economically active age groups. Gender distribution (M = 1.65, SD = 0.478) suggests a slight dominance of one gender category, while education (M = 1.61, SD = 0.925) and income (M =2.04, SD = 0.834) reflect generally moderate educational attainment and income levels. Occupational diversity appears relatively wide (M = 4.60, SD = 1.593).

Respondents generally reported Smartphone ownership, availability of financial agents, and adequate digital literacy (means ranging from 3.38 to 3.86), suggesting reasonable technological readiness for digital financial services. However, stable electricity access recorded a notably low mean (M = 1.78, SD = 1.013), indicating infrastructural constraints that may hinder digital financial adoption.

Most financial inclusion indicators recorded moderate to high agreement (means ≈3.39–4.32), indicating relatively positive perceptions of access, usage, affordability, and trust in financial services. Regular usage of formal services (M = 4.32, SD = 1.126) suggests behavioural engagement, although overall perceived inclusion (M = 3.39, SD = 1.357) indicates room for improvement.

Responses indicate strong acceptance of agency banking, particularly in accessibility, frequency of use, time savings, and affordability (means ≈3.66–4.07). Slightly lower reliability perception (M = 3.44, SD = 1.306) suggests operational challenges may still exist. Mobile money adoption is generally positive, with high confidence in usage (M = 4.20, SD =1.085) and perceived ease of transactions (means ≈3.63–3.97). These findings indicate that mobile money plays a significant complementary role in enhancing financial access.
Overall, the results suggest moderate financial inclusion supported by growing adoption of agency banking and mobile money services, though infrastructural limitations particularly electricity reliability remain a notable barrier.

4.4 Test of Normality

Table 4.4: Test of Normality Result

	Kolmogorov-Smirnov			**Shapiro-Wilk**		
Variables	**Statistics**	**df**	**Sig.**	**Statistics**	**df**	**Sig.**
Age	.186	459	.000	.912	459	.000
Gender	.417	459	.000	.604	459	.000
Educational Level	.256	459	.000	.871	459	.000
Monthly Income	.341	459	.000	.781	459	.000
Occupation	.251	459	.000	.798	459	.000
Infr	.173	459	.000	.918	459	.000
FI	.222	459	.000	.834	459	.000
AB	.172	459	.000	.849	459	.000
MM	.191	459	.000	.818	459	.000

Source: *Author's computation using SPSS 27*

Table 4.4 shows the test for normality result. Given the relatively large sample size (n = 459), interpretation rely primarily on the Kolmogorov–Smirnov statistics, which are generally preferred for larger samples. The results show that all variables recorded statistically significant p-values (p = .000), indicating rejection of the null hypothesis of normal distribution. This suggests that age, gender, education, income, occupation, infrastructure index, financial inclusion (FI), agency banking utilization (AB), and mobile money adoption (MM) are not normally distributed. However, in large samples, the Kolmogorov–Smirnov

test tends to detect even trivial departures from normality. Consequently, the observed non-normality does not necessarily invalidate parametric analyses such as regression, particularly where composite indices derived from Likert-scale measures approximate continuous data and the large sample size supports statistical robustness.

4.5 Pearson Correlation

Table 4.5 Pearson Correlations with Bootstrap Confidence Intervals among Study Variables

Variable	1	2	3	4	5	6	7	8
FI	—							
AB	.98***	—						
	[.98, .99]							
MM	.99***	99***	—					
	[.98, .99]	[.99, .99]						
Infr	-.06	-.05	-.06	_				
	[-.15, .04]	[-.14, .04]	[-.15, .03]					
Age	-.01	-.01	-.02	-.00	—			
	[-.10, .07]	[-.10, .07]	[-.10, .07]	[-.09, .09]				
Gender	-.02	-.03	-.03	-.02	**.79*****	—		
	[-.11, .07]	[-.12, .06]	[-.12, .06]	[-.11, .07]	[.76, .81]			
Education	-.01	-.01	-.01	-.03	**.93*****	**.82*****	—	
	[-.09, .08]	[-.10, .07]	[-.10, .07]	[-.11, .06]	[.92, .94]	[.79, .84]		
Income	.04	.05	.04	-.03	**.86*****	**.60*****	**.83*****	—
	[-.05, .12]	[-.03, .12]	[-.04, .12]	[-.12, .06]	[.84, .88]	[.56, .64]	[.81, .84]	
Occupation	-.02	-.03	-.03	-.01	**.85*****	**.90*****	**.88*****	**.71*****
	[-.11, .07]	[-.12, .06]	[-.12, .07]	[-.10, .08]	[.83, .87]	[.89, .92]	[.87, .90]	[.68, .74]

Source: *Author's computation using SPSS 27*

Note: FI = Financial Institution; AB = Agency Banking Utilization; MM = Mobile Money Adoption; Infr = Infrastructure Access. Values in square brackets indicate the 95% bias corrected and accelerated (BCa) bootstrap confidence intervals (5,000 samples). Confidence intervals that do not include zero are statistically significant. $p < .001$.

The Pearson correlation matrix as presented in table 4.5 reveals very strong positive associations between financial inclusion (FI), agency banking (AB), and mobile money (MM). Specifically, FI correlates strongly with AB ($r \approx .98$, $p < .001$) and MM ($r \approx .99$, $p < .001$), while AB and MM are also almost perfectly correlated ($r \approx .99$, $p < .001$). These exceptionally high coefficients suggest substantial conceptual overlap among these constructs and indicate a potential multicollinearity concern in subsequent regression analyses. Infrastructure (Infr) exhibits weak and statistically insignificant negative correlations with FI, AB, and MM (approximately $-.05$ to $-.06$), suggesting that perceived infrastructural conditions may not meaningfully influence financial inclusion outcomes in this dataset. Regarding socio-demographic controls, correlations between FI and variables such as age, gender, education, income, and occupation are very small and statistically insignificant, implying limited direct association with financial inclusion in this sample. However, strong positive inter-correlations are observed among the demographic variables themselves (e.g., age with education, income, gender, and occupation), indicating possible shared socio-economic gradients that should be considered when interpreting multivariate results. Overall, the findings highlight that digital financial service channels (agency banking and mobile money) are strongly linked to financial inclusion, but the near-perfect correlations warrant caution due to possible redundancy or multicollinearity effects in regression modelling.

4.6 Regression Result

Table 4.4: Summary of Linear Regression Results

Dependent Variable: FI

Predictor	**B**	**Robust *SE***	**B**	**T**	**P-value**	**95% CI**	**Tolerance**	**VIF**
Constant	-.411	.073		-6.403	.000	[-.560, -.268]		
DFI	1.072	.009	.989	130.127	.000	[1.056, 1.090]	.984	1.016
Infr	.000	.008	.000	.037	.971	[-.015, .016]	.989	1.011
Age	-.012	.032	-.010	-.421	.674	[-.076, .050]	.100	9.982
Gender	.056	.050	.020	1.104	.270	[-.044, .158]	.165	6.047
Education	.043	.036	.030	1.264	.207	[-.025, .115]	.098	10.205
Income	-.040	.025	-.026	-1.615	.107	[-.090, .008]	.225	4.436
Occupation	-.011	.018	-.013	-.602	.548	[-.047, .025]	.117	8.570
R^2	.974							
Adjusted R^2	.974							
F-statistic	2450.934							
Durbin-Watson	2.036							
Df	(7, 451)							
Overall p-value	.000							

Source: *Author's computation using SPSS 27*

A multiple linear regression was conducted to predict FI from DFI (composite digital finance index), Infr, and demographic characteristics (age, gender, education, income, occupation) as shown in table 4.6. Robust standard errors were used to account for heteroskedasticity. The regression model was statistically significant, $F(7, 451) = 2450.93$, $p < .001$, and explained97.4% of the variance in FI (Adjusted $R^2 = .974$).

DFI emerged as an extremely strong and significant predictor of FI (B = 1.072, Robust SE =0.009, $\beta = .989$, $t = 130.13$, $p < .001$, 95% CI [1.056, 1.090]). For every one unit increase in DFI, FI increased by approximately 1.07 units, holding all other variables constant. The near unity standardized coefficient ($\beta = .989$) indicates that DFI alone accounts for virtually all the explanatory power of the model.

In contrast, none of the demographic variables significantly predicted FI after controlling for DFI. Age (B = -.012, p = .674), Gender (B = .056, p = .270), Education (B = .043, p = .207), Income (B = -.040, p = .107), and Occupation (B = -.011, p = .548) all showed non-significant effects, with confidence intervals crossing zero. Infr also did not contribute to the model (B =.000, p = .971).

Multicollinearity diagnostics were satisfactory for DFI and Infr (VIF ≈ 1.0), confirming that creating the composite index successfully resolved the extreme multicollinearity previously observed between AB and MM. However, moderate to high multicollinearity was observed among the demographic variables (VIFs ranging from 4.44 to 10.21), which is consistent with their strong intercorrelations but does not affect the estimate for DFI. The Durbin-Watson statistic (2.036) indicated no autocorrelation in the residuals.

4.7 Discussion of Findings and Policy Implication

The empirical results indicate that Digital Financial Inclusion (DFI) capturing the combined influence of agency banking and mobile money adoption exerts a strong and statistically significant positive effect on financial inclusion. This finding supports the growing consensus in the literature that digital financial channels are central to expanding access to financial services, particularly in underserved rural contexts. For example, studies by Demirgüç-Kunt, et al., (2022) emphasized that digital finance significantly lowers transaction costs and reduces geographic barriers, thereby improving financial participation among previously excluded populations. Similarly, mobile money research by Jack & Suri (2014) and Suri & Jack (2016) demonstrates that mobile financial platforms enhance household financial resilience, savings behaviour, and access to formal financial services. The strong positive coefficient observed for DFI in this study therefore aligns with these empirical insights, suggesting that integrated digital financial ecosystems are effective mechanisms for promoting inclusive finance. National reports from CBN (2018) and survey by EFInA (2021) similarly highlight digital financial services particularly agent banking and mobile money as critical drivers of financial inclusion in Nigeria, especially in rural communities with limited banking infrastructure.

The insignificant effect of infrastructure variables once DFI is included in the model suggests that digital finance may partially offset traditional infrastructural constraints. This aligns with findings by Mbiti & Weil (2013), who argued that mobile financial technologies can substitute for weak physical banking infrastructure by enabling remote financial transactions. Furthermore, the limited explanatory power of socio-demographic factors (age, gender, education, income, and occupation) implies that digital financial platforms may reduce traditional inequalities in financial access. This observation is consistent with the financial inclusion framework advanced by Sarma (2008), which emphasizes accessibility and usability of financial services rather than solely demographic determinants. Overall, the results underscore the transformative role of integrated digital financial services in expanding financial inclusion within underserved communities.

The findings highlight the need for context-specific financial inclusion strategies in rural settings such as Apa LGA, where expanding agent banking outlets, improving mobile network reliability, and strengthening electricity access can substantially enhance digital financial service adoption. Policymakers including the Central Bank of Nigeria, EFInA, and development partners such as the World Bank should prioritize rural-focused regulatory incentives, agent liquidity support, localized financial literacy campaigns, and infrastructure investment in areas like Apa LGA to ensure that digital finance initiatives translate into sustained access, usage, and quality of financial services among underserved populations.

5. Conclusion and Policy Recommendation

The findings of this study demonstrate that digital financial inclusion represented by the combined effects of agency banking and mobile money services plays a dominant role in improving financial inclusion outcomes, particularly in rural environments such as Apa LGA. The strong explanatory power of the regression model indicates that expanding digitally enabled financial services is more impactful than relying solely on conventional banking expansion or demographic factors. Infrastructure and socio-demographic characteristics showed limited independent influence once digital financial inclusion was accounted for, suggesting that access to functional financial service channels may override traditional barriers such as age, gender, or income level. Overall, the results reinforce the argument that

digital financial ecosystems constitute a critical pathway toward inclusive finance in underserved rural communities. Based on this, the study recommends that:

1. Policymakers should encourage the expansion of agency banking outlets across underserved communities through incentives such as reduced licensing costs, agent liquidity support, and improved supervision. Expanding agent presence reduces distance barriers and enhances everyday access to financial services.
2. The Central Bank of Nigeria should continue refining regulatory frameworks that facilitate mobile money interoperability, fintech participation, and agent banking scalability while ensuring consumer protection and system stability.
3. Development partners such as EFInA should intensify targeted financial education campaigns in rural communities to improve digital financial awareness, reduce mistrust, and encourage sustained use of formal financial services.
4. Collaboration with international partners including the World Bank is essential to improve electricity reliability, mobile network coverage, and internet accessibility, which are foundational to effective digital financial service delivery.
5. Government agencies should adopt coordinated policies that combine digital finance promotion, infrastructure development, entrepreneurship support, and social protection payments through digital channels to accelerate inclusive economic development.

Collectively, these policy actions can substantially deepen financial inclusion in rural Nigeria by leveraging digital financial innovations while addressing structural barriers that hinder equitable access to formal financial services.

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