



FINTECH DISRUPTION AND FINANCIAL INCLUSION IN SUB-SAHARAN AFRICA DATA-DRIVEN ANALYSIS

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Abstract

This study examined the impact of fintech disruption on financial inclusion in Sub-Saharan Africa using a quantitative panel data analysis spanning 2015–2023. Employing pooled OLS, fixed effects, and random effects regression models, the research analyses secondary data from the World Bank Global Findex, IMF Fintech Index, GSMA Mobile Money Metrics, and other reputable sources. Key findings reveal a statistically significant positive relationship between fintech startups and financial inclusion (coefficient = 0.287, $p = 0.0021$ in the random effects model), suggesting that innovative fintech solutions contribute meaningfully to expanding financial access. However, mobile money transaction volumes exhibit an insignificant negative association (coefficient = -0.110, $p = 0.389$), challenging conventional assumptions about its transformative role. Fintech investments show no significant impact (coefficient = 0.006, $p = 0.952$), indicating potential misalignment between capital flows and inclusion objectives. Diagnostic tests confirm model validity, with no autocorrelation ($p = 0.2319$), heteroscedasticity ($p = 0.5600$), or non-normality ($p = 0.9408$) detected. The Hausman test ($\chi^2 = 6.109$, $p = 0.1911$) supports the use of random effects, accounting for unobserved country-level heterogeneity. The study underscores the importance of country-specific regulatory and infrastructural conditions in mediating fintech's inclusion effects. Policy recommendations emphasize fostering inclusive fintech innovation, strengthening enabling environments, and promoting cross-sector collaboration to enhance financial access across Sub-Saharan Africa.

Keywords: Fintech, financial inclusion, Sub-Saharan Africa, panel data analysis, mobile money, fintech startups, digital finance.

1. Introduction

Sub-Saharan Africa has emerged as a global frontrunner in fintech adoption, propelled by a swiftly expanding population, extensive mobile phone penetration, and a youthful demography (Appiah et al., 2025; Mhlana, 2025 & Oyelowo et al., 2024). Prominent instances like Kenya's M-Pesa, Nigeria's Paga, and South Africa's PayStack illustrate the transformative potential of fintech in advancing financial inclusion. These platforms have facilitated access to basic financial services, money transfers, and participation in economic activities for millions of previously unbanked persons with remarkable simplicity. The promise of fintech to enhance financial inclusion is acknowledged, although the degree and methods of its influence in Sub-Saharan Africa remain ambiguous (Mhlana, 2025A; Adelaja et al., 2024). Current studies on fintech and financial inclusion have predominantly concentrated on developed countries or particular case studies within Sub-Saharan Africa, resulting in a deficiency of a thorough, region-wide examination (Dzoboku, 2025; Falchetta et al., 2022). The swift expansion of fintech ecosystems and the diverse regulatory frameworks across SSA nations necessitate a more sophisticated comprehension of the impact of fintech innovations on financial inclusion results. This study seeks to fill these gaps by performing a data-driven analysis of the correlation between fintech disruption and financial inclusion in Sub-Saharan Africa.

The focus of this research is to assess fintech adoption impact on financial inclusion indicators in Sub-Saharan Africa (SSA). This research address critical inquiries such as what changes have occurred in fintech adoption in Sub-Saharan Africa over the last decade? does fintech startups demonstrate a consistent relationship with financial inclusion, does fintech investments alone predict inclusion gains and many more. This research aims to reveal significant insights that can influence the future of financial access in Sub-Saharan Africa by examining these concerns. The ramifications of this study reach beyond scholarly domains. The results can aid policymakers in formulating regulatory frameworks that reconcile innovation with consumer protection. Fintech companies can leverage this knowledge to develop goods and services specifically designed for the requirements of marginalized communities.



2. Theoretical Framework

This study's theoretical framework is based on three interrelated domains of literature: financial inclusion theory, digital disruption and innovation theory, and transaction cost economics.

2.1 Theories of Financial Inclusion

Financial inclusion is acknowledged as a crucial factor in promoting economic growth, alleviating poverty, and enhancing social equality (Ibitoye et al., 2025; Shah, 2025; Mishra et al., 2024). Financial inclusion fundamentally aims to offer consumers and businesses affordable and accessible financial services, encompassing savings, credit, insurance, and payment systems. Theories on financial inclusion highlight the significance of access to, utilization of, and quality of financial services in enhancing economic participation and mitigating inequality (Nambie et al., 2025 & Verma et al., 2024).

2.2 Digital Disruption and Innovation Theory

Fintech represents a form of digital disruption, where new technologies reshape traditional financial systems by offering more efficient, accessible, and user-friendly services (Nambie et al., 2025; Bhat et al., 2023). Using tools such as mobile platforms, blockchain, and artificial intelligence, fintech challenges conventional institutions and builds new financial ecosystems. Rogers' (2003) innovation diffusion theory helps explain how fintech adoption spreads within societies. The theory suggests that new technologies are first embraced by early adopters before diffusing to the broader population (Mbatha, 2024; Chen, 2024). In Sub-Saharan Africa, mobile money services like M-Pesa illustrate this process, beginning with urban users and later expanding to rural communities. The theory highlights relative advantage, compatibility, and ease of use as key drivers of fintech acceptance in the region.

2.3 Transaction Cost Economics

Williamson's (1985) transaction cost economics (TCE) provides a framework for understanding how fintech reduces barriers to financial inclusion. TCE argues that costs related to searching, negotiating, monitoring, and enforcing agreements often exclude low-income individuals and small enterprises from traditional finance (Zhang et al., 2025; Patil et al., 2024). In conventional financial systems, these costs are sometimes too high for low-income individuals and small enterprises, leading to their exclusion from official financial services. Fintech mitigates these difficulties by employing digital platforms to lower transaction expenses.

2.4 Empirical Reviews

Kamara et al. (2024) analyzed the impact of FinTech adoption on financial inclusion in 22 Sub-Saharan African countries using data from the World Bank and IMF. Through Principal Component Analysis and the generalized method of moments technique, they found that FinTech negatively affects the use and location aspects of financial inclusion but positively influences demographic dimensions and overall inclusion, challenging earlier assumptions.

Ololade et al. (2024) compared the role of fintech in enhancing financial inclusion in Africa and the United States. Their study showed that mobile money, digital banking, and blockchain significantly improve access for unbanked populations. However, challenges such as regulation, digital literacy, and infrastructure gaps limit the full potential of fintech in achieving equity.

Mashamba (2023) explored fintech's role in bank funding and economic growth across 19 Sub-Saharan African economies. The results indicated fintech increased equity funding for banks but had little effect on deposits and long-term loans. The study concluded that fintech has limited influence on economic growth in the region and does not mediate the relationship between bank funding and development, suggesting banks remain stable despite fintech disruptions.

Kim et al. (2024) investigated how mobile banking loans (MBLs) and fintech loans (FTLs) affect financial inclusion in Kenya. Their findings showed that while both loan types are widespread, MBLs are less accessible to vulnerable groups such as women and low-income earners, unlike FTLs. This demonstrates that increased loan availability does not necessarily translate into equitable access for marginalized populations.

Menza et al. (2024) studied fintech's impact on financial inclusion in Ethiopia using panel data from nine commercial banks between 2015 and 2020. Their results showed that ATM services, mobile banking, POS systems, and agent banking all had significant positive effects on financial inclusion, underscoring the importance of diverse digital financial services in expanding access.

This study addresses two main gaps in the literature on FinTech and financial inclusion. First, most research (e.g., Mashamba, 2023; Nguena, 2020) focuses on short-term effects, leaving limited evidence on FinTech's long-term impact on economic growth and financial stability. Second, while country-specific studies exist, there is a lack of comparative regional analysis on how FinTech shapes financial inclusion across Sub-Saharan Africa.

3.0 Methodology

This study adopted a quantitative explanatory research design to assess the impact of fintech disruption on financial inclusion across Sub-Saharan Africa. Using a panel data framework covering multiple countries and years, the analysis examined how fintech growth indicators relate to financial inclusion metrics. The study population comprised all 46 Sub-Saharan African countries, with the sample drawn from those with consistent and up-to-date data between 2015 and 2023. The research relied solely on secondary data sourced from internationally recognized institutions, including the World Bank's Global Findex Database (2014, 2017, 2021), the IMF Fintech Index, GSMA Mobile Money Metrics, Statista, World Economic Forum reports, and publications from national central banks and financial regulators.

3. Model Specification

A basic panel regression model is proposed as follows:

$$FI_{it} = \beta_0 + \beta_1 MMV_{it} + \beta_2 FINTECH_{it} + \beta_3 INVEST_{it} + \beta_4 X_{it} + \varepsilon_{it}$$
 Where: FI_{it} = Financial inclusion indicator in country i at time t , MMV_{it} = Mobile money volume, $FINTECH_{it}$ = Number of fintech startups, $INVEST_{it}$ = Fintech investment, X_{it} = Vector of control variables (GDP, internet access, etc.), ε_{it} = Error term

4. Results and Discussion

Table 4.1 Descriptive Statistics

	FI	MMV	FINTECH	INV
Mean	3879.583	8126.415	6571.298	17.30987
Median	1146.683	1269.322	764.9615	17.50000
Maximum	25725.87	40318.29	32868.49	29.80000
Minimum	28.22947	14.47117	8.570050	7.750000
Std. Dev.	5860.414	11875.70	9588.542	4.637785
Skewness	2.100091	1.362983	1.297453	0.269227
Kurtosis	7.125669	3.560473	3.388889	3.517521
Jarque-Bera	59.21542	13.23107	11.76149	0.952843
Probability	0.000000	0.001339	0.002793	0.621002
Sum	159062.9	333183.0	269423.2	709.7048
Sum Sq. Dev.	1.37E+09	5.64E+09	3.68E+09	860.3621
Observations	43	43	43	43

Source: Author's Computation, 2025.

Table 4.1: Descriptive Statistics

The statistics indicated that fintech adoption in Sub-Saharan Africa has grown significantly, but progress remains highly uneven across the region. Financial inclusion, mobile money transactions, and fintech startup activity all display wide gaps between mean and median values, coupled with large standard deviations and positive skewness. This shows that a small number of countries are driving regional averages upward, while the majority cluster at the lower end of the scale. For instance, mobile money transaction volumes and startup activity are heavily concentrated in a few vibrant markets, leaving most countries with minimal activity. In contrast, fintech investment appears more balanced, as the mean and median are closely aligned, though meaningful differences still exist across countries. These disparities suggest that while fintech has demonstrated remarkable potential to enhance financial inclusion, its benefits remain concentrated in specific markets rather than evenly spread across the region. The findings highlight the critical role of local factors such as regulatory frameworks, infrastructure quality, and market readiness in shaping outcomes, pointing to the need for policies that promote wider adoption to ensure fintech's benefits reach all corners of Sub-Saharan Africa.

4.2 Panel Unit Root

Table 4.2: Unit Root Test (Summary)

Variables	Panel Unit Root Test Method	
	Levin, Lin & Chu (LLC)	PP - Fisher Chi-square



	LLC statistics	Integration order	PP Fisher statistics	Integration order
FI	-16.8790	I(0)	39.1485	I(0)
MMV	-2.41110	I(0)	13.2626	I(0)
FINTECH	-1.99436	I(0)	25.0335	I(0)
INV	-6.31790	I(0)	29.8480	I(0)

Source: Authors Computation with Stata (2025)

Table 4.2: Panel Unit Root Test Results

The stationarity tests confirm that all key variables financial inclusion, mobile money volume, fintech startups, and fintech investment are integrated of order zero (I(0)), meaning they are stable and do not follow random walk behavior. Results from both the LLC and PP-Fisher tests strongly reject non-stationarity at the 1% level, ensuring the dataset is suitable for regression analysis. This implies that shocks, whether regulatory, technological, or market-driven, do not create permanent distortions in the data. The stability of these variables strengthens the reliability of cross-country and time-series comparisons, providing a solid foundation for the study's regression analysis and policy recommendations.

4.3 Correlation Analysis

Table 4.3 Correlation Analysis

	ROE	BLR	BCAP	NPL
FI	1	-0.0905	0.30395	0.0560
MMV	-0.0905	1	0.0226	0.03867
FINTECH	0.30395	0.02263	1	0.00389
INV	0.05603	0.03867	0.00389	1

Source: Authors Computation with Stata (2025)

Table 4.3: Correlation Analysis

The correlation analysis shows that fintech adoption and financial inclusion in Sub-Saharan Africa are connected, but the relationships are modest and fragmented. Fintech startups display a positive correlation (0.304) with financial inclusion, suggesting that strong startup ecosystems can support greater financial access, though other factors like regulation and infrastructure remain crucial. By contrast, mobile money volume has almost no relationship (-0.091) with inclusion, indicating that high transaction activity doesn't necessarily expand account ownership or broader service access, especially in mature markets. Fintech investment also shows only a weak correlation (0.056) with inclusion, pointing to a gap between investor priorities and inclusion needs, as well as the time lag before investments translate into outcomes. Notably, inter-fintech correlations are minimal, revealing that mobile money, startups, and investments largely evolve independently rather than reinforcing one another. Together, these patterns highlight a fragmented fintech landscape where no single driver ensures inclusion, underscoring the importance of integrated strategies that link mobile money systems, entrepreneurial innovation, and targeted investment.

Table 4.4: Pooled OLS Regression Model

Variables	Coefficient	Std. Error	T-Stat.	Prob.
C	-3.005467	2.536992	-1.184658	0.2437
MMV	-0.160239	0.291696	-0.549335	0.5861
FINTECH	0.449611	0.172731	2.602949	0.0132
INV	0.094720	0.234445	0.404020	0.6885
R-squared	0.196595			
Adjusted R-squared	0.109740			
F-statistic	7.263493			
Prob(F-statistic)	0.000822			

Source: Authors Computation with Stata (2025)

Table 4.4: Pooled OLS Regression Results

The pooled OLS regression highlights that fintech contributes to financial inclusion in Sub-Saharan Africa, but its impact is partial and context-specific. The model explains about 20% of the variation in financial inclusion ($R^2=0.196$), confirming fintech's relevance but also pointing to other unmeasured drivers. Fintech startups emerge as the most influential factor with a significant positive coefficient



(0.450, $p=0.013$), supporting the idea that innovation helps expand access, though their effect is not large enough to achieve inclusion alone. Mobile money volume shows a negative but insignificant relationship (-0.160 , $p=0.586$), suggesting transaction growth does not necessarily broaden financial access and may reflect saturation or substitution effects. Similarly, fintech investment has little explanatory power (0.095 , $p=0.689$), reinforcing concerns that capital inflows are often misaligned with inclusion objectives. The modest explanatory strength of the model (adjusted $R^2=0.110$) signals the importance of regulatory, institutional, and socioeconomic contexts in shaping outcomes. Overall, these findings suggest fintech is a meaningful but incomplete driver of inclusion, requiring supportive policies and broader structural factors to fully unlock its potential.

4.4.2 Fixed Effect or Least Square Dummy Variable (LSDV)

Table 4.5: Extracts from the Fixed Regression Result

Variables	Coefficient	Std. Error	T-Stat.	Prob.
C	2.947637	1.446931	2.037164	0.0500
MMV	-0.110029	0.126753	-0.868057	0.3918
FINTECH	0.277323	0.107830	2.571854	0.0099
INV	0.000970	0.100101	0.009690	0.9923
R-squared	0.881978			
Adjusted R-squared	0.848785			
F-statistic	26.57075			
Prob(F-statistic)	0.000000			

Source: Authors Computation with Stata (2025)

Table 4.5: Fixed Effects Regression Results

The fixed effects model shows that fintech's influence on financial inclusion is strongly shaped by country-specific conditions. With an R^2 of 0.882 and adjusted R^2 of 0.849, the model explains far more variation than pooled OLS, highlighting the importance of regulatory frameworks, infrastructure, and socioeconomic contexts in shaping outcomes. Fintech startups retain a positive and significant effect (coefficient = 0.277, $p = 0.0099$), though smaller than in the pooled model, indicating that part of their impact was previously overstated by not accounting for national characteristics. Mobile money volume again shows a negative but insignificant link (-0.110 , $p = 0.392$), suggesting its role is complex and may vary between complementing and substituting formal accounts. Fintech investment remains negligible (0.00097 , $p = 0.992$), reinforcing that capital inflows alone do not drive inclusion. The strong overall model fit ($F = 26.57$, $p < 0.0001$) confirms fintech's relevance but also points to other key mediators such as digital literacy, consumer trust, and product design. Overall, the findings suggest that while fintech startups consistently support financial access, their effectiveness is highly context-dependent, underscoring the need for tailored, country-specific policy approaches.

4.4.4 Random Effect Estimate

The outcomes of the random effect models are presented in Table 4.6.

Table 4.6: Extracts from the Random Effect Regression Result

Variables	Coefficient	Std. Error	T-Stat.	Prob.
C	2.572701	1.628964	1.579348	0.1228
MMV	-0.110177	0.126452	-0.871295	0.3892
FINTECH	0.287456	0.104887	2.740625	0.0021
INV	0.006018	0.099851	0.060269	0.9523
R-squared	0.801577			
Adjusted R-squared	0.764450			
F-statistic	12.04581			
Prob(F-statistic)	0.000000			

Source: Authors Computation with Stata (2025)



Table 4.6: Random Effects Regression Results

The random effects model reinforces fintech's relevance to financial inclusion while highlighting persistent complexities. With an R^2 of 0.802 and adjusted R^2 of 0.764, the model explains a large share of variation across Sub-Saharan Africa. Fintech startups maintain a significant positive effect (coefficient = 0.287, $p = 0.0021$), consistent with earlier models, confirming that innovation directly contributes to expanded access beyond country-specific contexts. Mobile money volume again shows a negative but insignificant relationship (-0.110 , $p = 0.389$), suggesting its role in promoting inclusion is limited or highly context-dependent. Fintech investment remains non-significant (0.006 , $p = 0.952$), underscoring that investment growth alone is a poor predictor of meaningful access improvements. The model is overall significant ($F = 12.05$, $p < 0.0001$), and the Hausman test ($p = 0.1911$) supports random effects as an appropriate specification. Together, these results show that fintech startups are a consistent driver of inclusion, while mobile money and investment metrics require more nuanced interpretation. This highlights the need for policy frameworks that go beyond transaction volumes and capital inflows to focus on the quality, reach, and inclusiveness of fintech solutions.

4.4.5 Interpretation of Random Effects Result

4.5 The Hausman Test

Table 4.7: Extract from the Hausman Test Result

Test Summary	Chi-square statistic	Chi-square d.f.	Prob.
Cross-section random	6.109323	4	0.1911

Source: Authors Computation with Stata (2025)

The Hausman test results ($\chi^2 = 6.109$, $p = 0.1911$) suggest that the random effects model is statistically appropriate for this analysis. The insignificant p-value indicates we cannot reject the null hypothesis that the random effects estimator is consistent, meaning the unobserved country-specific effects are likely uncorrelated with the independent variables.

Table 4.7: Diagnostic Tests

Tests	Prob
Autocorrelation	0.2319
Heteroscedasticity test	0.5600
Normality test	0.940821

Source: Authors Computation with Stata (2025)

The diagnostic tests confirm the model's statistical validity, with no evidence of major specification issues. The autocorrelation test ($p = 0.2319$) fails to reject the null of no serial correlation, suggesting the model adequately accounts for time-dependent patterns in the data. The heteroscedasticity test ($p = 0.5600$) similarly shows no signs of non-constant variance in the residuals, meeting a key regression assumption. The normality test ($p = 0.941$) indicates the residuals follow an approximately normal distribution, satisfying requirements for reliable statistical inference.

4.5 Discussion of Findings

The study's empirical results highlighted both the promise and the limitations of fintech in driving financial inclusion across Sub-Saharan Africa. The most consistent finding is the strong and statistically significant role of fintech startups, which remain positively linked to inclusion across all models. This suggests that innovative firms are effectively addressing gaps left by traditional financial institutions through digital solutions that lower costs and broaden access. In contrast, mobile money volumes show a persistent but insignificant negative relationship, indicating that while mobile money has transformed payments, its role as a pathway to broader financial services is more limited and context-dependent than often assumed. Similarly, fintech investments show no meaningful link to inclusion, suggesting that capital flows are not systematically aligned with inclusive priorities, often favoring profitable but less inclusive segments.

The strong performance of models that account for country effects emphasizes the critical influence of national conditions such as regulation, infrastructure, and digital literacy in shaping fintech outcomes. This helps explain why identical innovations may yield different results across African countries. Diagnostic checks confirm the robustness of the findings, and the Hausman test favors the random effects model, supporting broader generalization across the region. The results suggested that fintech can be a meaningful driver of financial inclusion, but its impact is neither automatic nor evenly



distributed. Policymakers must go beyond celebrating mobile money success stories and instead focus on nurturing inclusive fintech ecosystems. This requires encouraging startups that target underserved populations, aligning investment strategies with inclusion goals, strengthening enabling environments, and adopting richer measures of inclusion that capture depth and quality rather than just transaction growth.

5.1 Summary

This study examined the impact of fintech adoption on financial inclusion in Sub-Saharan Africa using panel data from multiple countries. The results show that fintech startups consistently expand access to financial services, highlighting their role in promoting inclusion. By contrast, mobile money transaction volumes show no significant effect, suggesting their influence is more limited and context-specific. Fintech investments also fail to predict meaningful gains, pointing to a misalignment between capital flows and inclusion priorities. The findings further stress the importance of national factors such as regulation, infrastructure, and socioeconomic conditions in shaping outcomes. Overall, the study emphasizes that fintech's role in inclusion goes beyond adoption metrics, requiring supportive environments and strategies that ensure accessibility and real usage.

5.3 Recommendations

The study recommends that to drive equitable financial inclusion Sub-Saharan Africa, policymakers and stakeholders should prioritize inclusive fintech innovation by supporting startups that target underserved populations through tailored products, affordable pricing, and accessible delivery channels. Concurrently, policymakers and stakeholders should strengthen enabling environments by investing in digital infrastructure, financial literacy programs, and adaptive regulatory frameworks to maximize fintech's inclusion potential. Finally, cross-sector collaboration should be fostered through partnerships between fintech firms, traditional banks, mobile operators, and policymakers to create integrated ecosystems that address the full range of financial service needs.

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