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Financial Inclusion Driven by Digital Financial Platforms: Impact on Economic Growth in Ghana

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Abstract: This study investigated the impact of financial inclusion, driven by digital financial platforms, on economic growth in Ghana between 2000 and 2023. Using secondary data from the World Development Indicators, the analysis applied Nonlinear Autoregressive Distributed Lag (NARDL) and Quantile ARDL (QARDL) models to capture both asymmetric and distributional dynamics. Existing literature affirmed the positive role of financial inclusion in development, but it often assumed linear and homogeneous effects and overlooked potential asymmetries. Despite global advances, financial exclusion remains acute in sub-Saharan Africa, where weak infrastructure, institutional inefficiencies, and structural barriers constrain access to finance. The results revealed that improvements in financial inclusion significantly enhanced economic growth by expanding savings, credit access, and productive investments, while reductions in inclusion undermined growth by restricting capital mobilisation and weakening financial intermediation. These findings highlighted the dual role of financial inclusion as both a growth enabler and a potential constraint when exclusion persists. Policy recommendations include expanding digital financial infrastructure in rural and marginalised communities, strengthening regulatory frameworks to enhance consumer protection and trust, and broadening financial literacy programmes to ensure effective utilisation of financial services. By integrating nonlinear and quantile-specific estimations, this study contributes new evidence to the fragile yet transformative role of digital finance in the development trajectory of Ghana.

Keywords: Financial inclusion; Digital finance; Mobile money; Economic growth; Ghana

JEL Classification: G20, G21, O16

1. Introduction

Financial inclusion has become a central pillar of sustainable economic growth and inclusive development, particularly in developing economies where large segments of households and firms remain excluded from formal financial systems (Chinoda & Kapingura, 2024). Broadly defined as access to and effective use of affordable financial services, financial inclusion enhances savings mobilisation, facilitates investment, supports entrepreneurial activity, and improves household welfare (Liu et al., 2021). Consequently, institutions of international development, including the World Bank, recognise financial inclusion as a key mechanism for achieving the Sustainable Development Goals (SDGs), notably those related to poverty reduction, inequality mitigation, and macroeconomic stability (Xi & Wang, 2023). Despite these global commitments, financial exclusion remains pervasive in sub-Saharan Africa, where vulnerable financial infrastructure, institutional inefficiencies, high transaction costs, and structural constraints continue to limit access to finance (Zhang et al., 2020). The rapid diffusion of digital financial platforms has, however, reshaped financial access across the region. Innovations such as mobile money, fintech applications, and agent banking have lowered geographic and cost barriers, hence facilitating payments, remittances, and basic savings for populations previously excluded from the

formal financial system (Ozturk & Ullah, 2022; Saraf & Kayal, 2022). Ghana represents one of the most prominent cases of the transition to digital-led inclusion. Since the introduction of mobile money services in 2009 and subsequent regulatory reforms, financial access in Ghana has expanded primarily through digital channels rather than the conventional expansion of bank branches. Mobile money accounts now exceed traditional bank accounts, signalling a structural shift in how households and firms interact with the financial system (Takyi et al., 2025). This transformation has improved participation among women, rural households, workers in the informal sector, and small enterprises, thereby altering savings behaviour, transaction patterns, and liquidity management (Afful et al., 2025).

However, the experience of digital financial inclusion in Ghana is neither uniform nor risk-free. Persistent challenges remain, including uneven network and agent coverage outside urban centres, limited enforcement of consumer protection, risks of cybersecurity, digital illiteracy, and trust deficits that hinder effective usage even when accounts exist (Coffie & Zhao, 2023). These constraints raise an important empirical question: Does financial inclusion consistently promote economic growth, or do its growth effects vary depending on whether access is expanding or contracting, and on the prevailing conditions of the economy? The combination of rapid digital financial expansion in Ghana, alongside institutional and structural vulnerabilities, therefore offers a compelling context for examining the stability, asymmetry, and distributional consequences of financial inclusion for economic growth. Existing empirical literature largely supports a positive finance-growth nexus, despite the persistence of important limitations. First, many studies assumed linear and homogeneous effects, implicitly treating financial inclusion as a uniformly beneficial growth driver (Appiah-Otoo, 2025; Ifediora et al., 2022). Such assumptions overlooked the possibility that expansions in financial access might generate different economic outcomes from contractions, particularly in digitally driven systems where disruptions, exclusion, or loss of trust could occur abruptly. Second, Ghana-focused studies remained limited in explaining how digital financial inclusion affected growth through channels such as capital mobilisation, investment efficiency, and financial deepening, despite the distinctive reliance on mobile money-based access in the country (Sarpong & Nketiah-Amponsah, 2022). Third, much of the literature relied on mean-based econometric techniques such as ordinary least squares (OLS), value at risk (VAR), or linear ARDL, which are inappropriate for capturing nonlinear adjustments or heterogeneous effects across different growth regimes (Fernandes et al., 2021; Yang & Zhang, 2020). These methodological choices may partially explain the mixed and sometimes contradictory findings reported in the finance-growth literature.

This study addressed these gaps by examining the impact of financial inclusion on economic growth in Ghana over the period of 2000 to 2023, with a combined nonlinear and distributional econometric framework. Employing the Nonlinear Autoregressive Distributed Lag (NARDL) model to capture asymmetric effects, the current study decomposed financial inclusion into positive and negative changes to test whether expansions and contractions in access could exert different short- and long-run growth effects (Shin et al., 2014). While asymmetry reveals whether the direction of change matters, it does not indicate whether financial inclusion is more consequential under conditions of weak or strong growth. Therefore, the Quantile Autoregressive Distributed Lag (QARDL) model is applied as a complementary and robust approach to capture heterogeneity across the conditional distribution of economic growth, hence allowing the impact of financial inclusion to vary among low-, middle-, and high-growth regimes (Cho et al., 2015). The NARDL answers whether increases and decreases in inclusion have different effects, while the QARDL identifies when inclusion matters most across growth states. The two models together provide a more comprehensive and policy-relevant understanding than either approach alone. The study made three key contributions: First, it provides Ghana-specific evidence on the asymmetric effects of digital financial inclusion, demonstrating that financial access can function as both a growth accelerator and a potential constraint when access deteriorates. Second, it offers new distributional insights by showing that the growth impact of financial inclusion is not uniform across economic conditions, with stronger effects in low- and middle-growth regimes than in high-growth periods. Third, by integrating nonlinear and quantile-based methodologies within a single framework, the study advanced the empirical finance-growth literature beyond conventional linear analyses and generated targeted policy implications for strengthening the resilience and effectiveness of Ghana's digital financial ecosystem.

The remainder of the paper is structured as follows: Section 2 reviews theoretical and empirical literature; Section 3 outlines the methodology; Section 4 presents results; Section 5 discusses findings; and Section 6 concludes with policy implications and recommendations.

2. Theoretical and Empirical Literature Review

2.1 Theoretical Perspectives

This study drew on the Endogenous Growth Theory and the Financial Intermediation Theory. Endogenous Growth Theory emphasises that innovation, human capital, and knowledge spillovers drive long-term growth within an economy (Odei-Appiah et al., 2022). In Ghana, digital platforms such as mobile money facilitate credit

access, reduce transaction costs, and stimulate investment, consistent with the proposition that inclusive finance fosters productivity and innovation (Abdulai & Issahaku, 2024).

Financial Intermediation Theory highlights the role of intermediaries in mobilising savings and allocating resources efficiently. Digital financial platforms now perform this role by extending services to marginalised populations and bridging gaps left by traditional banks (Ngong et al., 2024). They enhance liquidity, support consumption smoothing, and channel dispersed savings into formal systems, thereby stimulating growth. Together, the two theories provide an analytical foundation for understanding how financial inclusion, enabled by digital innovation, impacts both microeconomic welfare and macroeconomic development.

2.2 Empirical Evidence

Empirical research on the relationship between financial inclusion and economic growth yielded mixed and context-dependent results, reflecting differences in measurement, methodological choices, and stages of economic development. A strand of the literature reported a positive growth effect of financial inclusion; they argued that expanded access to finance improved the performance of small and medium enterprises, enhanced financial stability, and strengthened the transmission of monetary policy (Anane & Nie, 2022; Mbodj & Laye, 2025; Misati et al., 2024). These studies generally emphasised the role of inclusive finance in mobilising savings, facilitating investment, and smoothing consumption, particularly in developing economies with shallow financial markets. However, the magnitude and persistence of these effects vary substantially across countries and samples, suggesting that the finance-growth relationship may not be uniform. In contrast, another body of evidence highlighted potential downsides of rapid financial inclusion, particularly when driven by digital platforms without adequate regulatory and institutional safeguards. Studies focusing on financial vulnerability warned that over-indebtedness, fraud, weak consumer protection, and operational risks could undermine the growth benefits of inclusion and, in some cases, generate financial instability (Bull & Klapper, 2023). These findings implied that financial inclusion could act as a double-edged sword, promoting growth under favourable conditions while constraining it when access expanded faster than institutional capacity or financial literacy.

Methodological differences further contributed to these divergent conclusions. Much of the existing literature relied on cross-sectional analyses or linear and mean-based time-series and panel models, such as OLS, VAR, and conventional ARDL, which implicitly assumed symmetric and homogeneous effects of financial inclusion on growth (Appiah-Otoo, 2025; Takyi et al., 2025). Such approaches are limited in their abilities to capture the processes of nonlinear adjustment or distributional heterogeneity, thus potentially obscuring important dynamics in which positive and negative changes in financial inclusion generate unequal economic responses. Recent studies adopting nonlinear frameworks have provided evidence that the growth effects of financial inclusion are stronger at earlier stages of development and diminish as economies mature. The importance of accounting for asymmetry and regime-specific effects has been highlighted (Aitaa & Amadi, 2023; Coffie & Zhao, 2023). Despite these advances, there are two critical gaps. First, there is still a scarcity of Ghana-specific evidence, particularly studies that clearly differentiate between positive and negative changes in digital financial inclusion for a thoroughly developed empirical framework. Second, few studies which used non-linear techniques usually fail to address whether the effect of financial inclusion varies across growth regimes, and therefore miss the possibility of distributional heterogeneity in the relationship between finance and growth. This study filled these gaps by simultaneously using the models of NARDL and QARDL for Ghana, where asymmetric effects from expansions and contractions in financial inclusion could be acknowledged, and growth effects could be measured quantile-specifically across low, middle and high growth states. By doing so, the study shed more light on the nuanced and policy-relevant role of digital financial inclusion in economic growth in Ghana.

3. Development of Hypothesis

Financial inclusion has become a pivotal driver of economic growth in developing economies, where large segments of the population remain unbanked or underbanked. By expanding access to the savings, credit, insurance, and payment systems, inclusive finance enables households to manage risks, invest, and improve welfare productively (Abdulai & Issahaku, 2024). At the macro level, it facilitates capital mobilisation, strengthens financial stability, and enhances resource allocation (Afful et al., 2025; Aitaa & Amadi, 2023). Evidence from sub-Saharan Africa showed that mobile money and other digital platforms had transformed access to finance, thus reducing barriers to participation in the formal economy (Sarpong & Nketiah-Amponsah, 2022). In Ghana, these platforms have accelerated financial deepening and supported economic participation among marginalised groups (Frimpong et al., 2022). However, scholars cautioned that exclusion, over-indebtedness, and systemic vulnerabilities could offset these gains (Bull & Klapper, 2023; Odei-Appiah et al., 2022). Recent studies have emphasised that the effects of financial inclusion might not be uniform. Positive shocks, i.e., expansions in access, could stimulate growth, while negative shocks, i.e., declines in access, might constrain it. Similarly, the impact of growth may differ across economic states by being more pronounced in low- and middle-growth regimes than in

high-growth regimes (Coffie & Zhao, 2023). This underlines the importance of adopting nonlinear and quantile-based frameworks to capture asymmetries and heterogeneity in the finance-growth relationship. Based on this review, the study formulated the following hypotheses:

H1a: Positive shocks in financial inclusion (increases in access) have a significantly positive impact on economic growth in Ghana.

H1b: Negative shocks in financial inclusion (reductions in access) have a significantly negative impact on economic growth in Ghana.

H2: The impact of financial inclusion on economic growth is heterogeneous across different growth quantiles, with stronger effects observed in low- and middle-growth regimes compared to high-growth regimes.

4. Methodology of Research

4.1 Data and Sources

This study used the annual secondary data of Ghana, sourced mainly from the World Development Indicators (WDI) of the World Bank, for the period from 2000 to 2023. The WDI database is widely used in empirical macroeconomic research as it is consistent, transparent, and can also be compared across countries (Takyi et al., 2025). The chosen period is of special relevance for Ghana as it covers significant structural changes in the financial sector, including the introduction of mobile money services in 2009, regulatory reforms that followed and allowed expansion of agent banking and fintech, and the more general digitalisation agenda that has transformed access to financial services and payment systems around the country (Sarpong & Nketiah-Amponsah, 2022). Capturing both the pre- and the post-digital finance eras enabled this study to explore the interaction between financial inclusion and economic growth in changing institutional and technological circumstances.

Table 1. Summary of the description of variables

Variable	Operational Definition	Sources
	Dependent Variable	
Economic growth	GDP growth (annual %)	Ngong et al. (2024)
	Independent Variable	
Financial inclusion	Percentage of the population (age 15+) with an account at a financial institution or mobile money provider	Abdulai & Issahaku (2024)
	Control Variables	
Inflation rate	Consumer price inflation (annual %)	Anane & Nie (2022)
Population growth rate	Annual percentage change in population	Misati et al. (2024)
Unemployment rate	Percentage of labour force without employment (modelled ILO estimate)	Mbodj & Laye (2025)
Interest rate	Lending interest rate (%)	Bull & Klapper (2023)

From Table 1, economic growth was measured by annual GDP growth rates, which are standard variables used to measure macroeconomic performance and cyclical patterns (Ngong et al., 2024). The key explanatory variable, financial inclusion, was proxied by the percentage of the adult population (aged 15 years and above) that held an account at a formal financial institution or with a mobile money provider. This proxy was taken because it provided the most consistent and continuous time-series measure of financial access available for Ghana throughout the study period and directly reflected the digital-led inclusion pathway in the country, where mobile money accounts were the dominant entry point into the financial system (Ozturk & Ullah, 2022; Saraf & Kayal, 2022). Similar measures have been used extensively in recent studies on the growth of finance in economies in developing and Sub-Saharan Africa in particular (Abdulai & Issahaku, 2024).

Nevertheless, the financial inclusion mainly covered access to the financial services, but not their depth or intensity of use. It did not discriminate between active and dormant accounts, or between the volume of transactions, savings balances or utilisation of credit. Accordingly, while account ownership is a suitable proxy for broad financial inclusion in the Ghanaian context, in contexts where constraints related to digital literacy, trust or affordability remain, it may overstate effective usage. This limitation was explicitly recognized and it affected the interpretation of the results. To ensure that the effect of financial inclusion on economic growth was isolated from the study, the research paper incorporated some control variables which were theoretically and contextually relevant to the macroeconomic structure of Ghana. The inflation rate was added to reflect the macroeconomic stability, as Ghana had gone through periods of recurrent inflation that impacted real returns on savings and investment decisions or purchasing power (Anane & Nie, 2022; Takyi et al., 2025). Interest rate reflected the cost of borrowing in the credit market of Ghana, where high lending rates could affect private investment and reduce the growth-enhancing role of financial inclusion (Bull & Klapper, 2023). Unemployment rate was included to

account for the labour market, as persistent joblessness tended to weaken aggregate demand and limit the ability of households in turning the possibility of financial access into productive economic activity (Mbodj & Laye, 2025). Population growth rate was included to capture the growth of labour supply and consumption dynamics, which were especially relevant in the context of a youthful and growing population in Ghana (Misati et al., 2024). These variables were often employed in empirical growth studies and were particularly relevant in the case of controlling for Ghana-specific macroeconomic conditions that might confound the finance-growth relationship (Frimpong et al., 2022).

4.2 Model Estimation

The study employed the NARDL model as its primary estimation framework, with the QARDL model serving as a robustness check. The NARDL approach, which was developed by Shin et al. (2014), is particularly suitable for this purpose due to its capacity to decompose explanatory variables into positive and negative partial sums, thereby capturing asymmetries in both short-run and long-run effects. This is essential for the finance-growth nexus, as nonlinearities frequently occur in financial and macroeconomic interactions, which can result in distinct economic outcomes when financial inclusion increases versus decreases (Frimpong et al., 2022). This implies that the economic growth response to changes in financial inclusion is asymmetric; growth tends to increase more strongly when inclusion improves, but decline more sharply when inclusion deteriorates. Additionally, the NARDL framework provides methodological flexibility by allowing the integration of regressors of order $I(0)$ and $I(1)$, thereby preventing the loss of long-term information and ensuring that valid inferences can be drawn in the presence of mixed integration orders. To account for heterogeneous effects at various locations in the conditional distribution of economic growth, the study also implemented the QARDL approach, which was developed by Cho et al. (2015), in recognition of the constraints of mean-based models. The QARDL, in contrast to conventional linear estimations, enables the examination of quantile-specific impacts, which is crucial for comprehending the impact of financial inclusion on development in the face of changing economic conditions. For instance, the consequences of digital financial access may be more acute at lower growth quantiles, where constraints are severe, but they may diminish or even reverse at higher quantiles as a result of saturation or systemic risks (Ngong et al., 2024). This renders the methodology particularly pertinent for Ghana, a nation that is distinguished by structural disparities, varying levels of financial access, and developing digital ecosystems that can produce growth effects that are distributionally distinct (Anane & Nie, 2022). The methodology offered a comprehensive, robust, and policy-relevant empirical strategy by combining the strengths of the NARDL in modelling asymmetries with the ability of the QARDL to capture heterogeneity.

4.3 Specification of the Model

To formally examine the asymmetric and heterogeneous effects of financial inclusion on economic growth in Ghana, this study specified both the NARDL and QARDL models. These models were designed to capture long-run and short-run dynamics, account for asymmetries, and explore distributional variations in the financial sustainability response. The relationship was first modelled using a general functional form, followed by an NARDL specification that decomposed financial inclusion into positive and negative partial sums. The QARDL model was subsequently introduced to capture quantile-specific effects. The specifications are presented as follows:

$$DEG_t = f(FI) \tag{1}$$

where, EG_t denotes economic growth measured by the annual GDP growth rate at time t, and FI_t represents financial inclusion.

4.4 NARDL Specification and Asymmetric Decomposition

The asymmetric long-run relationship in the NARDL model is specified as:

$$DEG_t = \alpha_0 + \beta_1 FI_t^+ + \beta_2 FI_t^- + \sum_{k=1}^{4} \lambda_k CON_t^+ + \sum_{j=1}^{4} \lambda_j CON_t^- + \varepsilon_t \tag{2}$$

The positive and negative components of FI are summarised in a partial sum process as follows:

$$FI_t^+ = \sum_{i=1}^{t} \Delta FI_t^+ = \sum_{i}^{t} .\max\ (\Delta FI_t, 0)\ ,\&\ \ FI_t^- = \sum_{i=1}^{t} \Delta FI_t^- = \sum_{i}^{t} .\min\ (\Delta FI_t, 0) \tag{3}$$

where, $\Delta FI_i = FI_i - FI_{i-1}$.

FI_t^+ captures cumulative increases in financial inclusion, while FI_t^- captures cumulative decreases, allowing the model to test whether expansions and contractions in access exert different effects on economic growth.

In the NARDL setting, the dynamics of both the long run and short run can be incorporated in the following equation, including the error correction model with the introduction of the error correction term (ECT):

$$DEG_t = \alpha_0 + \emptyset DEG_{t-1} + \beta_1^+ FI_{t-1}^+ + \beta_2^+ FI_{t-1}^- + \sum_{k=1}^{4} \lambda_k CON_{t-1}^+ + \sum_{j=1}^{4} \lambda_j CON_{t-1}^- + \sum_{i=1}^{p-1} \varphi DEG_{t-1} \sum_{i=1}^{q-1} \left(\mu_1^+ FI_{t-1}^+ + \mu_2^+ FI_{t-1}^- + \sum_{k=1}^{4} \mu_k CON_{t-1}^+ + \sum_{j=1}^{4} \mu_j CON_{t-1}^- \right) + \omega ECT_{t-1} + \varepsilon_t \quad (4)$$

where, Δ denotes the first-difference operator; p, q, and r are optimal lag lengths selected using standard information criteria; and ECT_{t-1} is the error correction term. The error correction term (ECT) measures the speed at which short-run deviations from the long-run equilibrium are corrected. A negative and statistically significant coefficient on ECT_{t-1} indicates convergence toward long-run equilibrium, with its magnitude reflecting the rate of adjustment. The vector CON_t includes inflation rate, population growth rate, unemployment rate, and interest rate.

4.5 QARDL Specification and Growth-Regime Heterogeneity

To further capture the heterogeneous impact of financial inclusion across the distribution of financial sustainability, the study applied the QARDL model. The standard ARDL form is written as:

$$DEG_t = \varphi + \sum_{i=1}^{p} \phi_1 DEG_t + \sum_{i=0}^{q} \delta_1 FI_t + \sum_{i=0}^{r} \psi_1 CONT_t + \varepsilon_t \quad (5)$$

The QARDL model extends this by allowing coefficients to vary across quantiles $\tau \in (0,1)$.

$$Q_{DEG_t} = \varphi(\tau) + \sum_{i=1}^{p} \phi_1(\tau) DEG_t + \sum_{i=0}^{q} \delta_1(\tau) FI_t + \sum_{i=0}^{r} \psi_1(\tau) CONT_t + \varepsilon_t(\tau) \quad (6)$$

The generalised formulated model, which shows the QARDL-ECM model, is given below:

$$Q_{DEG_t} = \varphi(\tau) + \rho(\tau) \left(DEG_{t-1} - \beta FI^{(\tau)} FI_{t-1} - \sum_{k=1}^{4} \beta CON^{(\tau)} CON_{t-1} \right) + \sum_{i=1}^{p-1} \phi_1 DEG_t + \sum_{i=0}^{q} \delta_1(\tau) FI_t + \sum_{i=0}^{r} \psi_1(\tau) CONT_t + \omega ECT_{t-1} + \varepsilon_t(\tau) \quad (7)$$

where, $Q_\tau(EG_t)$ denotes the conditional quantile of economic growth at quantile τ, and $\rho(\tau)$ represents the quantile-specific speed of adjustment. A negative and significant $\rho(\tau)$ confirms long-run cointegration at that growth quantile.

To validate the reliability of the estimated NARDL and QARDL models, a set of diagnostic tests was conducted. The Durbin-Watson statistic was used to detect the presence of autocorrelation in the residuals, with values close to 2 indicating no serial correlation (Misati et al., 2024). The Breusch-Pagan test was employed to examine the presence of heteroskedasticity; a non-significant result confirmed that the variance of the residuals was constant, thus ensuring the efficiency of the estimators. To further assess the presence of conditional heteroskedasticity, the ARCH test was utilised to help verify the stability of error variances over the course of time (Anane & Nie, 2022). The Jarque-Bera test was used to evaluate the normality of residuals and supported the validity of statistical inference under the classical assumptions of linear regression. The Ramsey RESET test was applied to detect model misspecification, with a non-significant outcome indicating a correctly specified model (Odei-Appiah et al., 2022). In addition, the Variance Inflation Factor (VIF) was used to test for multicollinearity among explanatory

variables. A VIF below the conventional threshold of ten suggests the absence of harmful multicollinearity (Mbodj & Laye, 2025). These diagnostics confirm the appropriateness and stability of the empirical models used in analysing the link between financial inclusion and financial sustainability.

5. Descriptive Statistics and Results of Correlation

Table 2 offers a comprehensive analysis of the primary variables employed in the study, emphasising the central tendencies, variability, and distribution of the data. The mean value of financial inclusion was 0.785%, with a relatively low standard deviation of 0.132. This indicated that access to financial services was relatively consistent across the period, with values ranging from 0.590% to 0.912%. The mean of economic growth, as measured by the GDP growth rate, was 5.57%. However, the standard deviation was 2.83, which suggested a higher degree of variability in growth performance over the years. The EG fluctuated between 0.514% and 14%. The inflation rate was an average of 17.6%, with a significant dispersion of 10.5. This was indicative of macroeconomic instability, as inflation ranged from 7.14% to 41.5%. The population rate was comparatively consistent, with an average of 2.37% and a narrow deviation of 0.267, indicating modest demographic growth patterns. The fluctuations in the labour market throughout the period were reflected in the unemployment rate, which had a mean of 5.15% and a deviation of 2.22, with values ranging from 2.17% to 10.5%. Lastly, the interest rate had an average of 13.6%, with a significant variation of 5.37, ranging from 8.89 % to 30.9%. This suggested that the dynamics of monetary policy had changed over a long period.

Table 2. Descriptive statistics

Variable	Mean (%)	Std. Dev.	Minimum (%)	Maximum (%)
FI	0.785	0.132	0.590	0.912
EG	5.570	2.830	0.514	14.000
INR	17.600	10.500	7.140	41.500
PR	2.370	0.267	1.910	2.750
UR	5.150	2.220	2.170	10.500
IR	13.600	5.370	8.890	30.900

Note: FI is the financial inclusion, INR is the inflation rate, PR is the population rate, UR is the unemployment rate, EG is the economic growth, and IR is the interest rate.

Table 3. Results of correlation

Variable	EG	FI	INR	PR	UR	IR	VIF
EG	1						
FI	0.482**	1					2.104
INR	-0.312*	-0.227	1				2.328
PR	0.275*	0.391**	-0.489**	1			2.017
UR	-0.410**	-0.328*	0.513***	-0.372*	1		2.461
IR	-0.238	-0.198	0.346**	-0.289	0.457**	1	1.832

Note: (*), (**), (***) denotes 10%, 5% and 1% levels of significance respectively.

The findings in Table 3 indicated that economic growth was significantly and positively correlated with financial inclusion ($r = 0.482$, $p < 0.01$). This suggested that stronger economic growth was associated with higher levels of financial inclusion, which provided evidence that households and firms could save, invest, and contribute to productivity as a result of access to financial services. This result is consistent with the research of Chinoda & Kapingura (2024) and Liu et al. (2021), which emphasised that financial inclusion fostered long-term development and stimulated capital mobilisation. Similarly, the population rate exhibited a positive correlation with economic growth ($r = 0.275$, $p < 0.05$). This implies that population growth, when coupled with adequate economic opportunities, could generate a labour force that contributes to increased production and consumption. On the contrary, the inflation rate was negatively correlated with economic growth ($r = -0.312$, $p < 0.05$), suggesting that increased inflation can impede growth by eroding purchasing power, discouraging investment, and generating macroeconomic instability. This is in accordance with economic theory and prior research (Xi & Wang, 2023) that persistent inflation impeded prospects of growth. Similarly, the unemployment rate exhibited a robust negative correlation with economic growth ($r = -0.410$, $p < 0.01$). This suggests that higher unemployment rates are detrimental to economic expansion, as they result in the under-utilisation of productive human resources, which in turn weakens aggregate demand and overall output. Although the interest rate was negatively correlated with growth ($r = -0.238$, $p > 0.001$), the relationship was not statistically significant. This implies that economic performance is not consistently influenced by fluctuations in borrowing costs within the observed context. Additionally, the interrelations among the independent variables offered valuable insights. For example, inflation was negatively correlated with population growth ($r = -0.489$, $p < 0.01$), suggesting that increased inflation could

impede demographic expansion by reducing household welfare and consumption capacity. Furthermore, inflation was positively correlated with unemployment ($r = 0.513$, $p < 0.001$), and this indicates inflationary pressures on labour markets due to cost-push factors. A positive and significant correlation between unemployment and interest rates ($r = 0.457$, $p < 0.01$) implies that stricter monetary policies may exacerbate joblessness by restricting credit and investment opportunities. Finally, VIF values for all variables remain below the threshold of 5, with the highest being 2.461, indicating the absence of severe multicollinearity and confirming the reliability of the regression estimates.

5.1 Unit Root and Cointegration Tests

Table 4 presents the unit root test, conducted with both the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods, confirm the suitability of econometric models such as the NARDL and QARDL frameworks. These models could accommodate variables integrated at different orders, specifically $I(0)$ and $I(1)$. EG is non-stationary at levels, as indicated by the ADF (-2.089) and PP (-2.175) statistics, but becomes stationary after first differencing, with significant values of -4.512 and -4.489 to suggest integration at order one, $I(1)$. This implies that shocks to EG persist in the short term but converge to equilibrium in the long run. Similarly, PR, UR, and FI are also non-stationary at levels but achieve stationarity after first differencing, confirming their $I(1)$ processes.

Table 4. ADF and PP unit root tests

Variable	ADF (Level)	ADF (1st Diff.)	PP (Level)	PP (1st Diff.)	Order of Integration
EG	-2.089	-4.512***	-2.175	-4.489***	I (1)
FI	-1.220	-3.935***	-1.51	-4.067***	I (1)
INR	-3.212**		-3.125**		I (0)
PR	-1.895	-3.800***	-1.953	-3.825***	I (1)
UR	-1.760	-4.320***	-1.89	-4.145***	I (1)
IR	-3.452**		-3.331**		I (0)

Note: (**), (***) denotes 5% and 1% levels of significance respectively.

These results indicated that disruptions in these variables might generate persistent short-term effects, but they eventually reverted to equilibrium, thus highlighting their long-run relationships with other macroeconomic variables. In contrast, INR and IR were stationary at levels, with significant ADF and PP statistics of -3.212 and -3.452, respectively, indicating integration at order zero, $I(0)$. The mix of $I(0)$ and $I(1)$ variables not only rules out traditional techniques like Johansen cointegration but also justifies ARDL-type frameworks, which capture both short-run dynamics and long-run equilibrium, rendering them appropriate for robust analysis.

5.2 Non-Linear Autoregressive Distributed Lag (NARDL) Results

As presented in Table 5, the results indicated that positive shocks in financial inclusion significantly increased economic growth ($B = 0.215$, $p = 0.001$). This suggests that improvements in access to financial services, particularly through digital financial platforms such as mobile money and other inclusive banking innovations, stimulate savings, investment, and consumption, thereby fostering productive economic activity and accelerating growth. In contrast, negative shocks in financial inclusion dramatically diminished economic growth ($B = -0.162$, $p = 0.002$). Therefore, setbacks in financial access, whether through exclusion of vulnerable populations, systemic disruptions, or limited access to credit, impede economic performance and progress in development. This asymmetric effect emphasises the significance of maintaining the resilience of the financial sector and ensuring inclusivity, as the costs of contraction in financial access can counteract the benefits of expansion. The INR was associated with economic growth in a negative manner ($B = -0.087$, $p = 0.001$). This suggests that persistent inflation erodes purchasing power, discourages investment, and introduces macroeconomic instability that undermines the prospects of growth, which is consistent with classical and neoclassical economic theories of inflation-growth trade-offs. Similarly, the UR demonstrated a substantial negative correlation with growth ($B = -0.134$, $p = 0.004$). This relationship is indicative of the fact that high unemployment weakens aggregate demand, reduces household income, and dissipates productive capacity, thereby constraining the potential of long-term growth. The negative impact of IR on growth ($B = -0.076$, $p = 0.011$) is consistent with financial intermediation theory, which underscores the significance of affordable capital for growth. This implies that higher borrowing costs restrict the availability of credit to households and firms, thereby suppressing investment and restricting economic expansion. On the contrary, the PR had a substantially positive impact on economic growth ($B = 0.092$, $p = 0.005$). This suggests that population growth expands the labour force and increases consumption when it is matched with sufficient employment and economic opportunities, thereby contributing to national development and output. The results were statistically reliable, as the model exhibited strong explanatory power, with an R-squared of 0.823 and an adjusted R-squared of 0.798. This indicated that the variables included in the model

accounted for approximately 80% of the variations in economic growth. Besides, diagnostic tests verified the robustness of the model: the Breusch-Pagan test (p = 0.643) confirmed the absence of heteroskedasticity, the Ramsey RESET test (p = 0.387) demonstrated no model misspecification, the ARCH test (p = 0.722) indicated no serial correlation, and the Jarque-Bera test (p = 0.262) confirmed the normality of residuals. The Durbin-Watson statistic (1.943) indicated no evidence of autocorrelation.

Table 5. Estimates of long-run NARDL

Dependent Variable: Economic Growth				
Variable	**Coefficient**	**Std. Error**	***t*-Statistic**	***p*-Value**
FI^+	0.215	0.058	3.707	0.001
FI^-	-0.162	0.049	-3.306	0.002
INR	-0.087	0.024	-3.625	0.001
PR	0.092	0.031	2.968	0.005
UR	-0.134	0.045	-2.978	0.004
IR	-0.076	0.029	-2.621	0.011
Constant	4.215	1.048	4.021	0.000
R-squared	0.823			
Adjusted *R*-squared	0.798			
Breusch-Pagan	0.215			0.643
Durbin-Watson	1.943			
Jarque-Bera test	2.674			0.262
Ramsey RESET	0.984			0.387
ARCH test	0.356			0.722

Table 6. Estimates of short-run NARDL

Dependent Variable: Economic Growth				
Variable	**Coefficient**	**Std. Error**	***t*-Statistic**	***p*-Value**
ΔFI^+	0.127	0.046	2.761	0.008
ΔFI^-	-0.095	0.039	-2.436	0.017
Δ INR	-0.045	0.015	-3.000	0.004
Δ PR	0.057	0.022	2.591	0.012
Δ UR	-0.098	0.032	-3.063	0.003
Δ IR	-0.034	0.017	-2.000	0.048
ECT-1	-0.412	0.067	-6.149	0.000
Constant	3.845	0.928	4.145	0.000
R-squared	0.764			
Adjusted *R*-squared	0.735			
Breusch-Pagan	0.328			0.569
Durbin-Watson	2.012			
Jarque-Bera test	3.105			0.212
Ramsey RESET	0.762			0.448
ARCH test	0.412			0.678

The results in Table 6 revealed that financial inclusion had both positive and negative short-run effects on economic growth. In particular, the positive change in financial inclusion (ΔFI^+) exhibited a substantially positive effect (B = 0.127, p = 0.008), suggesting that enhancements in the availability and utilisation of financial services contribute to the acceleration of economic development in the short term. In contrast, the negative change in financial inclusion (ΔFI^-) indicated a substantially negative influence (B = -0.095, p = 0.017), indicating that any decrease in financial inclusion negatively affects economic growth. This reflects the sensitivity of growth to fluctuations in access to financial services. Changes in interest rates had a substantially negative impact on growth (B = -0.045, p = 0.004), suggesting that higher interest rates discourage borrowing and investment, thereby impeding short-term growth. Population rate demonstrated a substantially positive effect on economic growth (B = 0.057, p = 0.012), indicating that an increase in population can enhance economic activity by expanding the labour force, stimulating demand, and fostering higher productivity. The changes in unemployment rate exhibited a substantially negative effect (B = -0.098, p = 0.003), underscoring the fact that increasing unemployment impairs growth and reduces overall output. In the same vein, the inflation rate was discovered to have a detrimental impact on economic growth (B = -0.034, p = 0.048), suggesting that inflationary pressures diminish purchasing power and decrease economic activity. The error correction term (ECT-1) was highly significant and negative (B = -0.412, p = 0.000), suggesting a robust adjustment mechanism that corrects short-run instabilities towards long-run equilibrium at a rate of 41.2% per period. The presence of inherent growth dynamics that are independent of the included variables was suggested by the positive and significant constant term (B = 3.845, p = 0.000). The

diagnostic tests verified the reliability of the model: the *R*-squared value of 0.764 and adjusted *R*-squared of 0.735 demonstrated strong explanatory power, while the Breusch-Pagan ($p = 0.569$) indicated no heteroskedasticity, the Durbin-Watson statistic of 2.012 confirmed no autocorrelation, the Jarque-Bera test ($p = 0.212$) demonstrated the normality of residuals, the Ramsey RESET test ($p = 0.448$) suggested no model misspecification, and the ARCH test ($p = 0.678$) confirmed the absence of autoregressive conditional heteroskedasticity.

5.3 Quantile Autoregressive Distributed Lag (QARDL) Models

As shown in Table 7, the findings indicated that financial inclusion had both positive and negative asymmetric effects on economic growth across various quantiles, emphasising the distributional heterogeneity of its impact. At the 0.25 quantile, positive financial inclusion (FI^+) exhibited a significant effect ($B = 0.182$, $p = 0.014$), suggesting that improvements in access to financial services are essential for promoting growth in economies at the lower end of the growth distribution. Financial access plays a role in expanding credit, increasing savings, and promoting productive investments. The central importance of financial inclusion in driving growth in median-performing economies was underscored by the strengthening of this effect at the 0.50 quantile ($B = 0.219$, $p = 0.002$). However, the positive effect remained positive but weakened slightly at the 0.75 quantile ($B = 0.145$, $p = 0.068$), suggesting that the marginal benefit of financial inclusion diminishes in high-growth economies, likely due to the already developed financial systems. In contrast, growth was significantly reduced by negative shocks to financial inclusion (FI^-) at the 0.50 quantile ($B = -0.142$, $p = 0.005$), indicating that exclusion from financial systems disproportionately constrains growth in middle-performing economies. At the lower and median quantiles, INR exhibited a consistently negative effect ($B = -0.065$, $p = 0.037$; $B = -0.072$, $p = 0.003$), indicating that inflation is particularly detrimental to low- and mid-growth economies by eroding purchasing power and discouraging investment. Conversely, its effect was insignificant at the higher quantiles ($B = -0.048$, $p = 0.147$), indicating that advanced economies are more resilient to inflationary pressures. The PR had a positive impact on growth, with near-significant results at the 0.25 quantile ($B = 0.074$, $p = 0.054$) and stronger significance at the 0.50 quantile ($B = 0.095$, $p = 0.007$). This is evident in the way that population growth enhances labour supply and market expansion, particularly in mid-growth economies. However, the effect weakened at the 0.75 quantile ($B = 0.059$, $p = 0.082$). UR consistently reduced growth, with strong negative effects at the lower ($B = -0.103$, $p = 0.006$) and median quantiles ($B = -0.129$, $p = 0.001$). This underscores the impact of joblessness on productivity and demand in less-developed and mid-level economies. However, the effect became weaker at the higher quantile ($B = -0.086$, $p = 0.058$), suggesting that high-growth economies are relatively better positioned to absorb unemployment shocks. IR also negatively affected economic growth at the 0.50 quantile ($B = -0.061$, $p = 0.038$), indicating that increased borrowing costs limit investment. However, this effect was insignificant at other quantiles, indicating the differentiated sensitivity of economies to fluctuations of interest rates.

Table 7. QARDL long-run estimates

Variable	Dependent Variable: Economic Growth								
	0.25 Quantile			0.50 Quantile			0.75 Quantile		
	Coefficient	Statistics	*p*-Value	Coefficient	Statistics	*p*-Value	Coefficient	Statistics	*p*-Value
FI^+	0.182	2.541	0.014	0.219	3.202	0.002	0.145	1.876	0.068
FI^-	-0.127	-1.964	0.053	-0.142	-2.853	0.005	-0.098	-1.605	0.112
INR	-0.065	-2.135	0.037	-0.072	-3.015	0.003	-0.048	-1.452	0.147
PR	0.074	1.958	0.054	0.095	2.751	0.007	0.059	1.745	0.082
UR	-0.103	-2.804	0.006	-0.129	-3.602	0.001	-0.086	-1.932	0.058
IR	-0.054	-1.745	0.082	-0.061	-2.126	0.038	-0.039	-1.307	0.191
Constant	3.451	3.672	0.000	4.012	4.195	0.000	2.978	2.631	0.009
R-squared	0.754			0.798			0.682		
Adjusted *R*-squared	0.721			0.764			0.645		

Table 8. Diagnostic test

Test	0.25 Quantile	0.50 Quantile	0.75 Quantile
Breusch-Pagan	2.136 (0.412)	3.245 (0.238)	1.978 (0.489)
Durbin-Watson	1.874	1.945	2.102
Jarque-Bera test	3.541 (0.171)	2.874 (0.239)	4.127 (0.118)
Ramsey RESET	1.896 (0.087)	2.357 (0.049)	1.764 (0.102)
ARCH test	1.302 (0.214)	2.015 (0.089)	1.674 (0.156)

As presented in Table 8, the constant term was both significant and positive across all quantiles, suggesting that

the growth of the baseline is independent of explanatory factors. The robustness of the model was confirmed by model diagnostics, which demonstrated high *R*-squared values (0.754, 0.798, 0.682) and adjusted *R*-squared values (0.721, 0.764, 0.645). The absence of heteroscedasticity, normality of residuals, model stability, and no conditional heteroskedasticity is confirmed by the Breusch-Pagan, Jarque-Bera, Ramsey RESET, and ARCH tests.

As shown in Table 9, the findings indicated that financial inclusion had asymmetric short-term effects on economic growth across various quantiles, with both positive and negative changes exerting variable degrees of influence. At the 0.25 quantile, the positive effect of positive changes in financial inclusion (ΔFI^+) was significant (B = 0.096, p = 0.037). This suggests that in lower-performing economies, expanding financial access enhances credit access, savings mobilisation, and small-scale investments, thereby improving short-term growth. At the 0.50 quantile, this effect was more pronounced, as mid-growth economies experienced more pronounced benefits from financial deepening (B = 0.124, p = 0.005). However, at the 0.75 quantile, the positive effect weakened and became marginally insignificant (B = 0.081, p = 0.085), indicating diminishing short-run returns from financial inclusion in high-growth contexts. In contrast, negative shocks to financial inclusion (ΔFI^-) were detrimental, particularly at the 0.50 quantile (B = -0.089, p = 0.014), suggesting that financial exclusion or disruptions to access constrain short-term growth in mid-level economies. The adverse role of inflation in eroding purchasing power and discouraging investment was underscored by its significantly negative short-run effects at lower (B = -0.034, p = 0.038) and median quantiles (B = -0.042, p = 0.004). However, the effect was insignificant in high-growth economies (B = -0.029, p = 0.18), suggesting resilience against inflationary shocks in these economies. The population rate had a positive effect that was significant at the 0.50 quantile (B = 0.064, p = 0.011), where it stimulated labour supply and demand. However, its effect was attenuated and insignificant at the lower (B = 0.048, p = 0.075) and higher quantiles (B = 0.039, p = 0.097). The short-run negative impact of joblessness on productivity and consumption was reflected in the consistent reduction of growth at the 0.25 quantile (B = -0.058, p = 0.019) and median quantile (B = -0.076, p = 0.002).

Table 9. QARDL short-run estimates

Variable	Dependent Variable: Economic Growth								
	0.25 Quantile			0.50 Quantile			0.75 Quantile		
	Coefficient	Statistics	*p*-Value	Coefficient	Statistics	*p*-Value	Coefficient	Statistics	*p*-Value
ΔFI^+	0.096	2.102	0.037	0.124	2.875	0.005	0.081	1.723	0.085
ΔFI^-	-0.072	-1.854	0.064	-0.089	-2.463	0.014	-0.057	-1.526	0.127
Δ INR	-0.034	-2.098	0.038	-0.042	-2.913	0.004	-0.029	-1.341	0.18
Δ PR	0.048	1.785	0.075	0.064	2.552	0.011	0.039	1.672	0.097
Δ UR	-0.058	-2.351	0.019	-0.076	-3.147	0.002	-0.043	-1.982	0.051
Δ IR	-0.027	-1.652	0.099	-0.034	-2.105	0.036	-0.021	-1.274	0.202
ECT-1	-0.512	-4.892	0.000	-0.578	-5.214	0.000	-0.461	-3.782	0.001
Constant	2.384	3.248	0.002	2.891	3.978	0.000	2.105	2.673	0.008
R-squared	0.687			0.734			0.652		
Adjusted *R*-squared	0.654			0.701			0.617		

Note: FI is the financial inclusion, INR is the inflation rate, PR is the population rate, UR is the unemployment rate, and IR is the interest rate.

Table 10. Diagnostic test

Test	0.25 Quantile	0.50 Quantile	0.75 Quantile
Breusch-Pagan	2.215 (0.398)	3.157 (0.248)	2.031 (0.457)
Durbin-Watson	1.931	2.008	2.154
Jarque-Bera test	3.682 (0.159)	2.917 (0.224)	4.205 (0.127)
Ramsey RESET	1.978 (0.081)	2.489 (0.045)	1.826 (0.095)
ARCH test	1.414 (0.208)	2.137 (0.076)	1.789 (0.143)

However, the effect at the upper quantile was less pronounced (B = -0.043, p = 0.051), suggesting that advanced economies can more effectively absorb unemployment shocks. Interest rate had a substantially negative impact only at the 0.50 quantile (B = -0.034, p = 0.036), suggesting that financing costs restrict investments in mid-growth economies, while the effect is insignificant in other quantiles. The ECT-1 was highly significant and negative across all quantiles (B = -0.512, p = 0.000; B = -0.578, p = 0.000; B = -0.461, p = 0.001), indicating a strong adjustment towards long-term equilibrium. The correction of deviations ranged from 46% to 58% per period, depending on the growth level. The constant term was both significant and positive across all quantiles, suggesting that the growth of the baseline is independent of explanatory variables. The diagnostic tests presented in Table 10 confirm robustness, with no evidence of heteroscedasticity, residuals following a normal distribution, no serious misspecification, and no conditional heteroskedasticity. Durbin-Watson values near two suggested that there was

no autocorrelation.

6. Discussion of Findings and Contributions

6.1 Evaluation of the Hypotheses

H1a predicted that positive shocks in financial inclusion (FI^+) would have a significantly positive effect on the economic growth in Ghana.

The results supported this hypothesis (H1a). Results from both the NARDL and QARDL models indicated that expansions in financial inclusion significantly enhanced economic growth in the short and long runs. In the long run, positive shocks to financial inclusion promoted growth by improving saving mobilisation, easing liquidity constraints, and expanding access to credit for households and firms, thereby facilitating productive investment and entrepreneurial activity. These mechanisms align closely with Endogenous Growth Theory, which emphasises finance as a catalyst for productivity enhancement, innovation, and capital accumulation (Abdulai & Issahaku, 2024; Odei-Appiah et al., 2022). From a dynamic perspective, the short-run results suggest that improvements in financial access generate relatively rapid growth responses, reflecting the immediacy with which digital financial platforms, such as mobile money, reduce transaction frictions and enable consumption smoothing and small-scale investment. However, the long-run coefficients are larger and more persistent, indicating that the growth benefits of financial inclusion accumulate over the course of time as financial deepening improves intermediation efficiency and resource allocation. More importantly, the QARDL results revealed that the positive impact of FI^+ was strongest at the lower (Q 0.25) and median (Q 0.50) quantiles of economic growth, while the effect weakened at the upper quantile (Q 0.75). This pattern suggests that financial inclusion yields the greatest marginal growth returns when economic conditions are relatively weak or moderate, but exhibits diminishing returns as the economy approaches higher growth regimes, where financial access is already relatively widespread (Aitaa & Amadi, 2023; Coffie & Zhao, 2023).

H1b posited that negative shocks in financial inclusion (FI^-) would significantly reduce economic growth.

The results also supported the hypothesis (H1b). Both the NARDL and QARDL estimations showed that contractions in financial access exerted a statistically significant and economically meaningful negative effect on growth. In the short run, reductions in financial inclusion disrupt payment systems, restrict liquidity, and limit the ability of households to smooth consumption, leading to immediate declines in aggregate demand. In the long run, persistent exclusion undermines financial intermediation by constraining credit flows, weakening capital mobilisation, and discouraging private investment, thereby lowering potential output. These findings are consistent with Financial Intermediation Theory, which posits that efficient financial systems are essential for channelling savings into productive investment and maintaining macroeconomic stability (Takyi et al., 2025). Notably, the magnitude of the negative effects associated with FI^- is comparable to, and in some cases larger than, the positive effects of FI^+, thus highlighting the fragility of growth gains derived from financial inclusion. This asymmetry implies that setbacks in access arising from regulatory failures, digital fraud, infrastructure disruptions, or loss of trust can rapidly erode developmental progress (Aitaa & Amadi, 2023; Bull & Klapper, 2023; Coffie & Zhao, 2023). The quantile results further showed that the adverse impact of FI^- was most pronounced at the median growth quantile, suggesting that middle-performing economies may be particularly vulnerable to reversals in financial access.

H2 suggested that the impact of financial inclusion on economic growth was heterogeneous across different growth regimes, with stronger effects in low- and middle-growth states.

The results supported hypothesis (H2). The quantile-specific estimations revealed substantial variation in both the magnitude and statistical significance of financial inclusion effects across the conditional distribution of growth. At the low and median quantiles (Q 0.25 and Q 0.50), financial inclusion exerted a strong and positive influence on economic growth, reflecting its critical role in relaxing liquidity constraints, improving access to credit and payment systems, and enabling participation in productive economic activities among previously excluded households and firms. These findings are consistent with evidence that digital finance yields its greatest marginal returns where financial constraints are most binding (Abdulai & Issahaku, 2024; Aitaa & Amadi, 2023; Coffie & Zhao, 2023). By contrast, at the upper growth quantile (Q 0.75), both the positive and negative effects of financial inclusion were weaker and often statistically insignificant, suggesting diminishing growth returns to additional financial access in high-growth regimes where financial deepening is already relatively advanced. This distributional pattern implies that financial inclusion functions primarily as a growth-enabling rather than a growth-maximising mechanism, with its effectiveness conditioned by the stage of economic performance, institutional capacity, and the existing level of financial development (Ifediora et al., 2022; Misati et al., 2024). In the context of Ghana, where growth performance and financial access vary markedly over a long period of time and across sectors, the results indicated that digital financial inclusion delivered the greatest developmental leverage during periods or segments characterised by constrained growth rather than during already high-performing states (Appiah-Otoo, 2025; Sarpong & Nketiah-Amponsah, 2022).

6.2 Theoretical and Knowledge Contributions

This study advanced theory by extending the application of Endogenous Growth Theory to a nonlinear context. While the theory generally treats financial development as a consistent driver of long-term growth, our evidence showed that the relationship was asymmetric: positive shocks stimulated growth, while negative shocks suppressed it. This suggests that financial inclusion should be conceptualised not as an unconditional growth driver but as a conditional mechanism whose benefits depend on equitable and sustained access. Similarly, the application of Financial Intermediation Theory is broadened by recognising digital platforms as new forms of intermediaries that bridge gaps left by traditional banks. The findings highlighted the necessity of strong institutional support to ensure that these digital intermediaries maintained efficiency, resilience, and trust. Empirically, the study contributed by providing Ghana-specific evidence with advanced econometric approaches (NARDL and QARDL) that captured asymmetry and heterogeneity. This contrasts with earlier studies that relied on linear estimations, which might have overlooked distributional effects. By showing that the impact of financial inclusion varies across different growth regimes, the study enriched the finance-growth literature with a more nuanced understanding of how digital platforms contributed to development.

7. Conclusions and Policy Implications

This paper examined the relationship between financial inclusion and economic growth in Ghana from 2000 to 2023, applying the NARDL and QARDL models. The findings confirmed that financial inclusion played a pivotal but delicate role in the development of Ghana. Expansions in access through digital platforms enhanced productivity, participation, and growth, while contractions in access produced adverse effects that undermined development. The study thus highlighted the dual role of financial inclusion, as both an accelerator of growth and a potential source of fragility when disruptions occurred.

8. Confirmation of the Hypotheses

H1a predicted that positive shocks in financial inclusion would enhance growth. This was confirmed: expansions in financial access significantly stimulate the growth of GDP by increasing savings, credit use, and productive investments.

H1b predicted that negative shocks in financial inclusion would undermine growth. This was also confirmed: contractions in financial access significantly reduce growth by restricting intermediation and weakening capital mobilisation.

H2 posited that the effects of financial inclusion varied across growth regimes. This was validated: the strongest positive effects occur in low- and middle-growth states, while the impact diminishes in high-growth regimes.

Collectively, the findings confirmed that financial inclusion was both an enabler of growth and a potential constraint when accessing declines. Its developmental benefits are therefore conditional rather than guaranteed.

9. Implications on Policy

The empirical results showed that expansions in financial inclusion significantly promoted economic growth, particularly in low- and middle-growth regimes, while contractions in access generate disproportionately large negative effects, thus underscoring the fragile and asymmetric nature of the finance-growth relationship. This implies that financial inclusion should be treated not merely as an access-expansion objective but as a resilience-sensitive growth strategy, since gains from growth can be rapidly reversed when digital access is disrupted, or trust in financial systems weakens. In response, policy efforts should prioritise investment in digital financial infrastructure, especially in rural and marginalised communities, to ensure reliable network coverage and agent liquidity that prevent exclusionary setbacks. Strengthening regulatory frameworks is equally critical, with emphasis on consumer protection, cybersecurity standards, and fraud prevention to sustain confidence in digital financial platforms. At the same time, comprehensive financial literacy programmes should be expanded to enable households and small businesses to effectively and productively utilise digital financial services, rather than merely holding accounts. Finally, financial institutions and fintech providers should be incentivised to develop affordable and user-friendly digital products tailored to the needs of SMEs, informal sector workers, and smallholder farmers. Overall, these measures can help Ghana convert digital financial inclusion into a resilient and sustainable driver of economic growth while mitigating the risks of exclusion and systemic disruption.

10. Limitations

The study has several limitations which should be acknowledged. First, it is based on national-level secondary data, which may conceal important regional/sectoral or demographic differences in the financial inclusion and

economic growth in Ghana. Second, financial inclusion is proxied by account ownership, which is largely about access, and therefore may not adequately reflect depth or intensity of use and may overstate effective financial participation in contexts where digital literacy, trust, affordability, or account dormancy remain issues. Third, while the nonlinear econometric framework accounts for asymmetries and distributional heterogeneity, it does not explicitly account for possible structural breaks related to significant policy changes, technological shifts or global shocks (such as the sudden post-2010 explosion of mobile money or exogenous crises that may have changed the relationship between inclusion and growth). Finally, the country-specific focus on Ghana means that the generalisability of the results to other developing economies with differing institutional and financial structures is limited.

11. Suggestions for Future Research

Future research can build on this study in several important ways. First, the use of micro-level household and firm datasets would enable researchers to escape access-based proxies and directly pick up depth, frequency, and quality of financial service usage, hence overcoming limitations associated with account-ownership measures. Second, future studies should make explicit modelling of structural breaks and regime shifts, such as the post-2009 mobile money expansion, major regulatory reform or global shocks. For example, using methods such as breakpoint tests, time-varying parameter models, or sub-sample analyses could better understand the evolution of the finance-growth relationship over a long period of time. Third, mixed-method approaches, combining econometric analysis and qualitative evidence, could offer richer insights for behavioural factors, trust, digital literacy, and institutional constraints that influence successful financial inclusion. Fourth, comparative cross-country analyses within sub-Saharan Africa would boost the external validity of the work and enable the systematic assessment of the condition of inclusion-led growth, depending on the quality of institutions and the maturity of digital ecosystems. Finally, future research should focus on the role of emerging financial technologies such as blockchain-based payments, artificial intelligence-powered credit scoring and digital identity systems in promoting deeper inclusion whilst reinforcing resilience against exclusion, fraud, and systemic risk.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to this study.

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