



Financial Inclusion and Economic Growth in Algeria: An Empirical Investigation Using the ARDL Framework (1995–2023)

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Abstract

This study examines the relationship between financial inclusion and economic growth in Algeria over the period 1995–2023. The analysis focuses on the impact of financial institutions depth (FIDI) and financial market depth (FMDI) on GDP per capita, used as an indicator of economic growth. The Human Development Index (HDI) and Control of Corruption (CC) are included as control variables to account for social and institutional factors.

The study employs the Autoregressive Distributed Lag (ARDL) model to analyze both short-run and long-run relationships among the variables. The data are obtained from international sources, including the International Monetary Fund (IMF) and governance indicators databases.

The findings provide insights into how financial inclusion, governance quality, and human capital influence Algeria's economic performance. The results highlight the importance of strengthening financial systems and improving institutional governance to support sustainable economic growth.

Article info

Received

16/03/2026

Accepted

02/08/2026

Keyword:

- ✓ Financial Inclusion
- ✓ Economic Growth
- ✓ Financial Development

Introduction

The connection between financial inclusion and economic growth has increasingly become a central theme in the field of development economics. Financial inclusion generally refers to the ability of individuals and enterprises to access and effectively utilize affordable financial services, including banking, credit, insurance, and payment systems. It is widely considered an important mechanism for expanding economic opportunities and alleviating poverty (Demirgüç-Kunt & Klapper, 2013). By integrating a broader segment of the population into the formal financial system, financial inclusion facilitates savings mobilization, improves access to financing, and encourages productive investment and consumption. These channels contribute to higher levels of economic activity and ultimately support long-term economic growth.

Economic growth, commonly evaluated through indicators such as Gross Domestic Product (GDP), remains a fundamental measure of a country's economic performance and societal progress. Nevertheless, unequal access to financial services has historically limited the development potential of many economies, particularly in emerging and developing countries. In response to these constraints, both researchers and policymakers increasingly emphasize the importance of financial inclusion as a driver of inclusive and sustainable development (Beck, Levine, & Loayza, 2000).

Within the Algerian economy, the relationship between financial sector development and economic growth has attracted growing scholarly interest. Empirical evidence suggests the presence of a bidirectional causal relationship between these two dimensions, indicating that financial development and economic growth reinforce each other (Bouras & Fekir, 2020). On the one hand, economic expansion contributes to the development and modernization of the financial sector. On the other hand, an efficient and well-structured financial system promotes growth by improving the allocation of financial resources, facilitating investment, and encouraging economic diversification.

Against this background, the present study examines the impact of financial inclusion on GDP per capita in Algeria over the period 1995–2023. To capture different dimensions of financial inclusion, two indicators developed by the International Monetary Fund (IMF) are employed: the Financial Institutions Depth Index (FIDI) and the Financial Market Depth Index (FMDI). The FIDI reflects the level of development and accessibility of financial institutions, whereas the FMDI measures the depth and liquidity of financial markets. Taken together, these indicators provide a more comprehensive assessment of the financial system's capacity to support economic development.

To analyze these relationships, the study applies the Autoregressive Distributed Lag (ARDL) modeling approach, which is particularly suitable for examining both short-run and long-run interactions among economic variables. In addition to the financial inclusion indicators, several control variables are incorporated to better capture the broader determinants of GDP per capita. The Human Development Index (HDI) is included to account for the influence of social development factors such as education, health, and living standards, while the control of corruption index is used as a proxy for institutional quality and governance, which can significantly affect economic performance.

Research Problem

Although financial inclusion is increasingly recognized as an essential component of economic development, its precise contribution to economic growth in Algeria has not been sufficiently investigated. Most existing studies addressing the Algerian financial sector have primarily concentrated on the broader concept of financial development, while relatively few empirical analyses have specifically assessed the role of financial inclusion and its different dimensions.

In particular, limited attention has been given to examining how indicators reflecting the depth of financial institutions and financial markets may influence economic performance, especially in terms of GDP per capita. Understanding this relationship is crucial, as financial inclusion can serve as a mechanism for improving access to financial resources, supporting productive investment, and enhancing economic participation.

Moreover, the Algerian economy continues to face several structural constraints that may affect the effectiveness of financial inclusion policies. These include challenges related to limited financial accessibility, variations in institutional governance, and disparities in human development outcomes. Such factors can potentially shape the extent to which financial inclusion contributes to economic growth.

In light of these considerations, the present study seeks to address the following research question:

To what extent has financial inclusion affected GDP per capita in Algeria over the period 1995–2023?

Research Hypotheses

Drawing on the theoretical and empirical contributions in the literature addressing the relationship between financial development and economic performance, several hypotheses are proposed to examine the determinants of economic growth in Algeria.

H1: The depth of financial institutions (FID) has a positive effect on GDP per capita, as a more developed institutional financial sector improves access to financial services and facilitates resource mobilization.

H2: The depth of financial markets (FMD) positively contributes to GDP per capita by enhancing capital allocation efficiency and supporting investment activities within the economy.

H3: Higher levels of human development, as measured by the Human Development Index (HDI), are expected to positively influence GDP per capita by improving the quality of human capital and productivity.

H4: Stronger control of corruption (CC) is hypothesized to positively affect GDP per capita, since better governance and institutional transparency promote a more favorable environment for economic activity and investment.

1. Literature Review: The Linkage Between Financial Inclusion and Economic Growth

The relationship between financial inclusion and economic growth has long attracted considerable attention within the field of economic development. Early theoretical contributions emphasized the fundamental role of financial systems in supporting economic activity. For instance, Goldsmith (1959) highlighted the importance of financial structures in mobilizing savings and channeling them toward productive investments. Similarly, McKinnon (1973) and Shaw (1973) stressed the significance of financial deepening and the liberalization of financial markets, arguing that more developed financial systems improve liquidity and enhance the efficiency of resource allocation, which ultimately contributes to economic growth. Empirical evidence provided by (King & Levine., 1993) further confirmed these theoretical perspectives by demonstrating that financial development plays a crucial role in improving credit allocation and stimulating long-term economic expansion.

In more recent years, academic attention has increasingly shifted toward the concept of financial inclusion, which emphasizes the accessibility and equitable distribution of financial services across different segments of society. (Demirgüç-Kunt & Klapper, 2013) contributed significantly to this field by developing global indicators designed to measure the level of financial inclusion across countries. Building on this work, (Allen, Demirguc-Kunt, Klapper, & Peria, 2016) examined the

structural barriers that prevent individuals and firms from accessing financial services and stressed the importance of removing these obstacles to foster inclusive financial systems. Other scholars, such as (Sarma & Pais, 2011) and (Chakravarty & Pal, 2013), expanded the analysis by linking financial inclusion with broader development outcomes, including poverty reduction and improved socio-economic indicators, drawing insights from country-specific experiences such as India.

Additional contributions have sought to quantify financial inclusion through composite indices and comparative cross-country analyses. Among these, the work of (Amidžic, Massara, & Mialou, 2014) introduced multidimensional measures of financial inclusion and demonstrated its relevance for improving economic performance across different economies. Overall, the existing literature increasingly recognizes financial inclusion as a key component of sustainable and inclusive economic growth. However, further research remains necessary to better understand its interaction with emerging dynamics such as digital financial innovation, economic inequality, and the growing integration of global financial markets.

2. ARDL econometric study: Estimation of the Impacts of Financial Inclusion on Economic Growth in Algeria

This research analyzes the impact of financial inclusion on economic growth in Algeria over the period 1995–2023, using GDP per capita as the primary indicator of economic performance. To capture the different dimensions of financial inclusion, the study relies on two indices developed by the International Monetary Fund (IMF). The first is the Financial Institutions Depth Index (FIDI), which reflects the level of development and accessibility of financial institutions. The second is the Financial Market Depth Index (FMDI), which measures the size, liquidity, and efficiency of financial markets. Together, these indicators provide a comprehensive perspective on the extent to which the financial system supports inclusive economic participation and efficient capital allocation, both of which are essential for sustainable economic development.

To investigate the relationship between financial inclusion and economic growth, the study adopts the Autoregressive Distributed Lag (ARDL) approach. This econometric technique is particularly suitable for analyzing both short-run and long-run interactions among economic variables. In addition to the financial inclusion indicators, the model incorporates several control variables to better capture the broader determinants of economic growth. The Human Development Index (HDI) is included to represent the influence of social development factors such as education, health, and living standards. Furthermore, the Control of Corruption Index is introduced as a proxy for institutional quality and governance effectiveness, which can significantly shape the overall economic performance of a country.

Building on earlier empirical and theoretical contributions, such as those of (Beck, Demirgüç-Kunt, & Levine, 2007) and (King & Levine., 1993), this study highlights the crucial function of financial institutions in fostering entrepreneurial activity, reducing poverty, and stimulating economic growth in developing economies. These studies demonstrate that well-developed financial systems facilitate access to credit, improve financial intermediation, and support productive investment, thereby contributing to higher levels of economic performance.

In addition, the findings of (Levine & Zervos, 1998) stress the importance of financial market development, particularly market depth, in improving the efficiency of capital allocation and lowering the cost of financing for businesses. Deep and liquid financial markets enable more effective distribution of financial resources and provide greater opportunities for investment and economic expansion.

By integrating these theoretical insights with the selected financial inclusion indicators, the present research seeks to provide a clearer understanding of the mechanisms through which financial inclusion influences economic growth in Algeria. Furthermore, the study aims to generate policy-relevant insights that may assist in strengthening the national financial system and promoting inclusive and sustainable economic development.

2.1. The ARDL Approach: Definition, Steps, and Advantages:

The Autoregressive Distributed Lag (ARDL) approach is an econometric technique widely employed to investigate dynamic relationships among variables in time series analysis. One of its main advantages lies in its ability to simultaneously capture short-run dynamics and long-run equilibrium relationships within a single modeling framework. Unlike many conventional cointegration techniques, the ARDL model can be applied when the variables involved are integrated at different orders, specifically $I(0)$ or $I(1)$, provided that none of them are integrated of order two, $I(2)$. In this framework, the dependent variable is expressed as a function of its own lagged values as well as the lagged values of the explanatory variables, allowing the model to account for temporal interdependencies among the variables.

The empirical analysis generally begins with unit root testing to determine the order of integration of each variable. This step is essential to ensure that none of the variables exhibit integration of order two, which would invalidate the ARDL approach. Standard procedures such as the Augmented Dickey–Fuller (ADF) test and the Phillips–Perron (PP) test are commonly applied to evaluate the stationarity properties of the time series.

Following the stationarity assessment, the optimal lag structure of the model must be determined. Selecting appropriate lag lengths is crucial because it enables the model to adequately capture the

dynamic behavior of the variables while avoiding problems such as over-parameterization. Model selection criteria such as the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) are typically used to identify the most suitable lag specification.

Once the optimal lag structure has been identified, the ARDL model can be estimated to examine both short-term and long-term relationships between the dependent variable and its explanatory variables. To verify the existence of a long-run equilibrium relationship among the variables, the ARDL bounds testing procedure is commonly employed. This test compares the calculated F-statistic with critical values to determine whether cointegration is present.

To ensure the robustness and validity of the estimated model, several diagnostic tests are conducted. These tests generally include checks for serial correlation, heteroscedasticity, and the normality of residuals. Such diagnostic procedures help confirm that the model satisfies the necessary econometric assumptions.

After the estimation stage, the long-run coefficients can be derived to interpret the equilibrium relationships among the variables. In addition, the error correction term (ECT) is incorporated to capture the speed at which deviations from the long-run equilibrium are corrected following short-term shocks. The magnitude and significance of this coefficient provide important information regarding the adjustment process of the system.

The general form of the ARDL model can be expressed as follows:

$$Y_t = \varphi + \sum_{i=0}^p \theta_i Y_{t-i} + \sum_{j=0}^q \beta_j \Delta X_{t-j} + \varepsilon_t$$

With $\varepsilon_t \sim iid(0, \sigma)$: error term; « β_0 » represents the short-term effect of X_t on Y_t .

We can determine the long-term effect using the following equilibrium relationship:

$$Y_t = k + \varphi X_t + u$$

In this case, the long-term effect of X_t on Y_t denoted by φ , can be determined as follows:

$$\varphi = \frac{\sum \text{des coefficients de } X_t}{1 - \sum \text{des coefficients de } Y_t}$$

2.2. Model Specification

This study examines the relationship between financial inclusion and economic growth in Algeria using the Autoregressive Distributed Lag (ARDL) model, which allows the analysis of both short-term and long-term relationships between variables. GDP per capita is used as the dependent variable, representing economic growth, while the explanatory variables include financial inclusion indicators and selected control variables reflecting broader socio-economic and institutional factors.

The dependent variable is expressed as the natural logarithm of GDP per capita ($\ln GDP$) for the period 1995–2023. This transformation facilitates the interpretation of coefficients in percentage terms, helps stabilize variance, and improves the robustness of the econometric analysis.

Financial inclusion is captured through two indicators. The Financial Institutions Depth Index (FIDI) measures the accessibility and development of financial institutions, reflecting their ability to provide financial services and support investment activities. The Financial Market Depth Index (FMDI) represents the size and liquidity of financial markets, highlighting their role in efficient capital allocation and in reducing financing costs.

To improve the model's explanatory power, additional control variables are included. The Human Development Index (HDI) captures the influence of education, health, and living standards on economic performance, while the Control of Corruption Index (CC) reflects governance quality and institutional effectiveness, both of which can significantly influence economic growth.

2.2.1. Econometric Approach

The ARDL model is employed due to its flexibility in analyzing both short-run dynamics and long-run relationships among variables. This approach is particularly appropriate when the variables exhibit mixed orders of integration, namely $I(0)$ and $I(1)$. Moreover, the ARDL technique provides reliable estimations even with relatively small sample sizes, making it suitable for examining the period 1995–2023.

The general specification of the ARDL model used in this study is expressed as follows:

$$\ln GDP_{PC} = \alpha + \beta_1 FIDI + \beta_2 FMDI + \beta_3 HDI + \beta_4 CC + \varepsilon$$

Where :

➤ α : Constant term.

- $\beta_1, \beta_2, \beta_3, \beta_4$: Coefficients of the independent variables, representing the marginal impact of each variable on financial development.
- ε : Error term, capturing unobserved influences.

2.2.2. Hypotheses

H1: The depth of financial institutions (FID) has a positive effect on GDP per capita, as a more developed institutional financial sector improves access to financial services and facilitates resource mobilization.

H2: The depth of financial markets (FMD) positively contributes to GDP per capita by enhancing capital allocation efficiency and supporting investment activities within the economy.

H3: Higher levels of human development, as measured by the Human Development Index (HDI), are expected to positively influence GDP per capita by improving the quality of human capital and productivity.

H4: Stronger control of corruption (CC) is hypothesized to positively affect GDP per capita, since better governance and institutional transparency promote a more favorable environment for economic activity and investment.

2.3. Econometric Estimation and Result Interpretations

2.3.1. Unit Root Tests: Examining Stationarity

This section examines the stationarity properties of the variables in order to determine their order of integration. The Phillips–Perron (PP) unit root test is applied due to its ability to evaluate stationarity while accounting for potential serial correlation and heteroskedasticity in the error terms. A time series is considered stationary when the absolute value of the test statistic exceeds the corresponding critical value at conventional significance levels (1%, 5%, or 10%).

To enhance the robustness of the analysis, three model specifications are considered:

- Model 1: Includes trend and constant.
- Model 2: Includes constant only.
- Model 3: Excludes both trend and constant.

Table 1. Phillips-Perron Unit Root Tests variable

Model	Model 1:	Model 2:	Model 3:
Order of Integration	I(0)	I(1)	I(0)
ln GDP_PC	0.8846	0.0127	0.5882
FIDI	0.1903	0.0001	0.8608
FMDI	0.1761	0.0002	0.6480
HDI	0.0000	0.0000	0.0000
CC	0.0023	0.000	0.0004

Source: Eviews 12 SV outputs

The results indicate that the natural logarithm of GDP per capita (lnGDP_PC) is non-stationary at level but becomes stationary after first differencing across all model specifications, indicating that the variable is integrated of order one, I(1). A similar pattern is observed for financial inclusion measured by the Financial Institutions Depth Index (FIDI). The variable is non-stationary at level in all models, with p-values exceeding the 5% significance threshold, but becomes stationary after first differencing, confirming that it is integrated of order I(1).

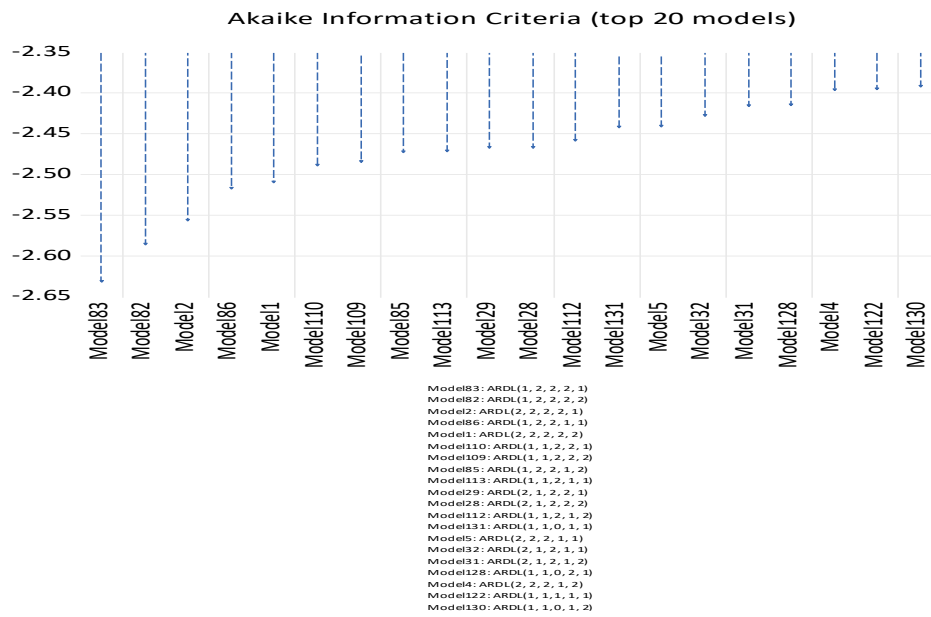
The Financial Market Development Index (FMDI) also exhibits non-stationarity at level in Models 1 and 2. In Model 3, the p-value at level is close to the 5% significance level, suggesting near stationarity. However, after applying the first difference, the series becomes stationary in all specifications, indicating that FMDI is predominantly integrated of order I(1).

The Human Development Index (HDI) presents mixed results. It appears stationary at level in Models 1 and 2, while it becomes stationary only after first differencing in Model 3. This suggests that HDI exhibits characteristics of both I(0) and I(1). A similar behavior is observed for the Control of Corruption Index (CC), which is stationary at level in Models 1 and 2 but requires first differencing in Model 3 to achieve stationarity. After differencing, CC becomes stationary across all models.

Given that the variables are integrated at either I(0) or I(1) but not I(2), the ARDL framework is appropriate for analyzing the relationship between financial inclusion (FIDI, FMDI), economic growth (lnGDP_PC), and the control variables (HDI and CC).

2.3.2. Identification of the Optimal Lag

This study develops an optimal ARDL specification to examine the relationship between lnGDP_PC and its explanatory variables (FIDI, FMDI, HDI, and CC) while accounting for dynamic time effects. The selection of the appropriate lag structure is based on the Akaike Information Criterion (AIC). A total of 162 alternative model specifications were evaluated, and the model with the lowest AIC value was selected, ensuring a balance between model accuracy and parsimony while avoiding overfitting.

Fig.1.Lags Selection

Source: Eviews 12 SV outputs

According to the model selection criteria, particularly the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC), the optimal lag structure identified for this study is **ARDL (1,2,2,1,2)**. This specification includes **one lag for lnGDP_PC**, **two lags for both FIDI and FMDI**, **one lag for HDI**, and **two lags for the Control of Corruption (CC) variable**, allowing the model to adequately capture the dynamic relationships among the variables.

Determining the presence of a cointegration relationship using the "Bound Test"

The Bound Test (Pesaran et al., 2001) assesses cointegration in the ARDL model by comparing the F-statistic to predefined bounds...

Table 2. The results of the "bounds test"

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	8.339054	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Finite Sample: n=35				
Actual Sample Size	26	10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532
Finite Sample: n=30				
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Source: Eviews 12 SV outputs

The estimated **F-statistic (8.339054)** exceeds the upper critical bound at all conventional significance levels, confirming the presence of cointegration and leading to the rejection of the null hypothesis of no long-run relationship. This result indicates that the variables share a stable long-term equilibrium despite short-term fluctuations. Further diagnostic tests are conducted to assess the reliability and validity of the estimated model.

2.3.3. Evaluation of the Robustness of the Estimated ARDL Model

To evaluate the reliability and robustness of the estimated model examining the relationship between financial inclusion and economic growth in Algeria, several diagnostic tests are conducted. These tests are essential to verify whether the model satisfies the key econometric assumptions. Four main diagnostic procedures are applied:

- Breusch–Godfrey Serial Correlation LM Test to detect the presence of autocorrelation in the residuals.
- White Test for Heteroscedasticity to examine whether the variance of the residuals is constant.
- Jarque–Bera Test to assess the normality of the residual distribution.
- Stability tests using CUSUM and CUSUM of Squares (CUSUMSQ) to evaluate the structural stability of the model over the sample period.

2.3.3.1. Breusch-Godfrey Serial Correlation (LM) Test

To examine whether autocorrelation is present in the residuals, the **Breusch–Godfrey Serial Correlation LM test** is employed. This test evaluates whether the error terms are correlated across different time periods. The hypotheses are defined as follows:

- H_0 : No serial correlation in the errors; $COV(\varepsilon_t, \varepsilon_s) = 0, \text{ pour } t \neq s$
- H_1 : Presence of autocorrelation; $COV(\varepsilon_t, \varepsilon_s) \neq 0$

Table 3. Results of the Residual Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.062578	Prob. F(2,11)	0.9397
Obs*R-squared	0.292494	Prob. Chi-Square(2)	0.8639

Source: Eviews 12 SV outputs

The results of the **Breusch–Godfrey LM test** indicate a probability value of **0.9397**, which is well above conventional significance levels. This result implies that the null hypothesis of no serial

correlation cannot be rejected. Consequently, the residuals appear to be independent, confirming the absence of autocorrelation and supporting the adequacy of the lag structure selected in the model.

2.3.3.2. White Heteroscedasticity Test

The null hypothesis of homoscedasticity assumes that the variance of errors remains constant across all observations. To verify this assumption, we apply White's heteroscedasticity test. The hypotheses are as follows:

- H0: Errors are homoscedastic, with constant variance $V(\epsilon_t) = \sigma^2$ for all t .
- H1: Errors exhibit heteroscedasticity, with variance dependent on t , i.e. $V(\epsilon_t) = \sigma_t$

Table 4. Results of the Residual Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.475276	Prob. F(12,13)	0.8962
Obs*R-squared	7.928329	Prob. Chi-Square(12)	0.7907
Scaled explained SS	1.839365	Prob. Chi-Square(12)	0.9996

Source: Eviews 12 SV outputs

In this case, the p-value from the White test is 0.8962, which significantly exceeds the 0.05 threshold, confirming that the model's errors are homoscedastic.

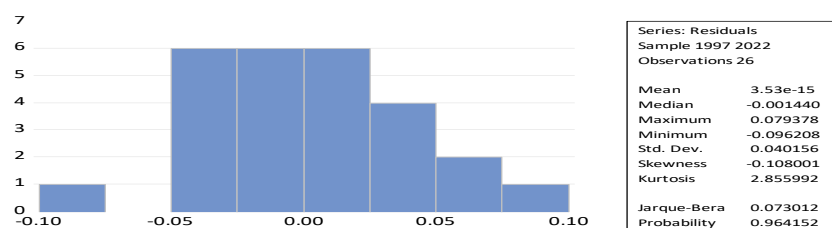
2.3.3.3. Test for Error Normality:

To assess whether the model's errors follow a normal distribution, the Jarque-Bera test is commonly applied. This test examines the third moment (skewness) and the fourth moment (kurtosis) of the distribution.

The hypotheses are as follows:

- H0: The errors follow a normal distribution, $\epsilon_t \sim N(0, \sigma^2)$
- H1: The errors do not follow a normal distribution.

Fig.2. Residual Normality Test



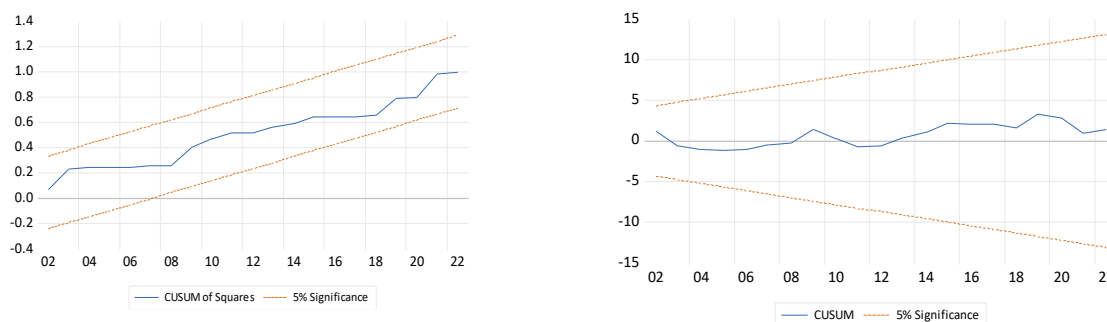
Source: Eviews 12 SV outputs

The results reported in the table show that the **Jarque–Bera statistic equals 0.073012**, with a **p-value of 0.964125**, which is considerably higher than the 5% significance level. Consequently, the null hypothesis of normally distributed residuals cannot be rejected. This indicates that the residuals follow a normal distribution, satisfying one of the essential assumptions required for the validity of econometric models.

2.3.3.4. CUSUM and CUSUMSQ tests

The **CUSUM and CUSUM of Squares (CUSUMSQ) tests** are used to verify the structural stability of the estimated model throughout the sample period. These procedures examine whether the model's parameters remain consistent over time. When the cumulative statistics evolve within the critical confidence bands, the null hypothesis of parameter stability is maintained, indicating that the estimated coefficients do not experience significant structural changes. In contrast, if the plotted statistics cross the critical boundaries, this suggests the presence of structural instability in the model, implying that the coefficients may vary over time.

Fig.3.CUSUM Test



Source: Eviews 12 SV outputs

The results of the **CUSUM and CUSUMSQ stability tests** show that the cumulative statistics remain within the critical confidence bounds throughout the sample period. This outcome suggests that the estimated parameters do not experience structural breaks over time. Consequently, the null hypothesis of parameter stability cannot be rejected, confirming that the model's coefficients remain stable at the **5% significance level**.

Analysis of Long-Term Coefficients

The study's long-term results highlight critical relationships between financial inclusion, governance indicators, and Algeria's economic growth from 1995 to 2023.

Table 5. Long-term results

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FIDI	-21.94662	5.091185	-4.310710	0.0008
FMDI	12.31050	7.793829	1.579519	0.1382
CC	0.024003	0.007220	3.324496	0.0055
HDI	17.37132	2.248350	7.726251	0.0000
C	-3.466210	1.305256	-2.655577	0.0198
EC = LGDP_PC - (-21.9466*FIDI + 12.3105*FMDI + 0.0240*CC + 17.3713*HDI - 3.4662)				

Source: Eviews 12 SV outputs

The estimation results show that the **Financial Institutions Depth Index (FIDI)** has a coefficient of **-21.94662** with a probability of **0.0008**, indicating significance at the **1% level**. The negative relationship suggests that financial institutions in Algeria may suffer from structural inefficiencies. The dominance of state-owned banks, limited governance mechanisms, and potential credit misallocation may reduce their contribution to economic growth. While previous studies (Beck, Demirgüç-Kunt, & Levine, 2007) emphasize the positive role of financial institutions in promoting growth, the Algerian context highlights the need for reforms aimed at improving efficiency and governance within the banking sector.

The **Financial Market Depth Index (FMDI)** presents a coefficient of **12.31050** with a probability of **0.1382**, indicating that the variable is not statistically significant. Although the positive sign suggests a potential contribution to economic growth, the lack of significance reflects the relatively underdeveloped nature of Algeria's financial markets, characterized by low liquidity and limited participation. Strengthening market development and encouraging private investment could enhance the role of financial markets in supporting economic activity.

The **Control of Corruption (CC)** variable shows a positive and significant coefficient of **0.024003** with a probability of **0.0055**. This result highlights the importance of institutional quality in fostering economic growth. Effective anti-corruption policies can enhance transparency, improve governance, and strengthen investor confidence, which ultimately supports economic performance (Mauro, 1995).

Similarly, the **Human Development Index (HDI)** demonstrates a positive and highly significant effect on GDP per capita, with a coefficient of **17.37132** and a probability of **0.0000**. This finding confirms the key role of human capital in economic development. Improvements in education, health, and living standards contribute to higher productivity and long-term economic growth (Barro, 1991).

Finally, the **constant term** is negative (**-3.4682**) and significant at the **5% level**, suggesting that structural constraints—such as the economy's dependence on hydrocarbons—may limit Algeria's

baseline growth potential. Overall, the results highlight the importance of strengthening financial sector governance, improving institutional quality, and investing in human development to support sustainable economic growth in Algeria.

2.3.4. Analysis of Short-Term

The short-run dynamics between financial inclusion, governance quality, and economic growth in Algeria over the period **1995–2023** are examined using an **Error Correction Model (ECM)**. This approach enables the analysis of both immediate and lagged effects of key variables, including financial depth indicators, corruption control, and human development, on GDP per capita. The results provide insights into structural constraints within the economy and highlight potential policy areas that could improve economic performance and strengthen growth outcomes.

Table 6. Short-term results

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FIDI)	-18.19063	2.021841	-8.997060	0.0000
D(FIDI(-1))	-5.151683	2.054709	-2.507257	0.0262
D(FMDI)	6.505985	3.212041	2.025499	0.0639
D(FMDI(-1))	10.73512	3.158455	3.398852	0.0048
D(CC)	0.005801	0.001420	4.085834	0.0013
D(HDI)	-5.945792	2.520100	-2.359348	0.0346
D(HDI(-1))	-7.600084	2.783606	-2.730302	0.0172
CointEq(-1)*	-0.545036	0.065483	-8.323358	0.0000
R-squared	0.905355	Mean dependent var		0.041861
Adjusted R-squared	0.868549	S.D. dependent var		0.130526
S.E. of regression	0.047324	Akaike info criterion		-3.015950
Sum squared resid	0.040312	Schwarz criterion		-2.628844
Log likelihood	47.20735	Hannan-Quinn criter.		-2.904478
Durbin-Watson stat	2.025830			

Source: Eviews 12 SV outputs

The short-run estimation results reveal that the Financial Institutions Depth Index (FIDI) exerts a negative and statistically significant effect on economic growth in the short term (coefficient = -18.19063, p-value = 0.0000). This finding suggests structural inefficiencies within Algeria's banking sector, which remains largely dominated by state-owned institutions. The lagged value of FIDI also remains negative and significant (coefficient = -5.151683, p-value = 0.0262), further indicating persistent weaknesses in credit allocation and institutional governance.

In contrast, the Financial Market Depth Index (FMDI) demonstrates a positive short-term relationship with economic growth (coefficient = 6.505985, p-value = 0.0639), highlighting the potential role of financial markets in supporting economic activity. The lagged effect of this variable is stronger and

statistically significant (coefficient = 10.73512, p-value = 0.0048), suggesting that financial market development contributes more effectively to growth over time.

The Control of Corruption (CC) variable shows a positive and highly significant impact (coefficient = 0.005801, p-value = 0.0013), emphasizing the importance of governance quality in improving economic performance. Conversely, the Human Development Index (HDI) displays negative short-term effects (coefficient = -5.94579, p-value = 0.0346; lagged coefficient = -7.600084, p-value = 0.0172), which may reflect structural constraints that delay the translation of investments in education and health into immediate productivity gains.

The error correction term (CointEq(-1)) confirms the existence of a strong long-run equilibrium relationship, with a coefficient of -0.545036 (p-value = 0.0000), indicating that approximately 54.5% of short-term disequilibrium is corrected each year. Additionally, model diagnostics show strong explanatory power, with an adjusted R^2 of 0.868549 and a relatively low Akaike Information Criterion (AIC) value of -3.015950.

Overall, the findings suggest that while financial market development supports economic growth, the banking sector requires structural reforms to improve efficiency. Strengthening governance mechanisms and addressing structural challenges in human development remain essential for enhancing Algeria's long-term economic performance.

Conclusion

This study analyzes the relationship between financial inclusion and economic growth in Algeria during the period 1995–2023, using the ARDL approach to investigate both short-run dynamics and long-run equilibrium relationships. The results highlight the complex interaction between financial development, institutional quality, and human capital in shaping the country's economic performance.

The findings indicate that the Financial Institutions Depth Index (FIDI) has a negative and significant impact on economic growth, suggesting structural inefficiencies within Algeria's banking sector, which remains largely dominated by state-owned institutions. Weak governance mechanisms and inefficient credit allocation appear to limit the capacity of financial institutions to effectively support productive investment and economic expansion. In contrast, the Financial Market Depth Index (FMDI) exhibits a positive but statistically insignificant long-run effect, reflecting the relatively limited role of financial markets due to their low liquidity and restricted development. Strengthening financial market infrastructure, improving regulatory transparency, and encouraging greater private participation could enhance their contribution to economic growth.

The Control of Corruption (CC) variable shows a positive and significant relationship with economic growth, emphasizing the importance of institutional quality in promoting economic efficiency and

investor confidence. Strengthening anti-corruption policies and improving governance structures therefore remain key priorities. Meanwhile, the Human Development Index (HDI) confirms the crucial role of human capital in long-term economic development. Although its short-term effects appear negative—possibly due to delays in translating social investments into productivity gains—its long-term contribution to growth remains substantial.

The short-run analysis reveals persistent structural challenges within the financial sector, while governance improvements and financial market development show encouraging contributions to economic activity. Furthermore, the error correction mechanism confirms the presence of a stable long-term relationship among the variables, with a significant adjustment process toward equilibrium.

Overall, the results suggest that achieving sustainable economic growth in Algeria requires coordinated policy efforts aimed at strengthening financial sector efficiency, improving institutional governance, and investing in human capital development. Such reforms would allow financial inclusion to play a more effective role in supporting inclusive and sustainable economic progress.

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