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The Impact of Financial Inclusion on Economic Growth in Algeria: An Econometric Study Using the Autoregressive Distributed Lag (ARDL) Model for the Period 2004–2024

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Abstract

This study aims to investigate the impact of financial inclusion on economic growth in Algeria during the period 2004–2024, using the Autoregressive Distributed Lag (**ARDL**) model, where per capita gross domestic product was used as the dependent variable, and the number of bank accounts as the main independent variable representing financial inclusion, whilst including oil prices and inflation as control variables. The standardised results indicate the existence of a long-run cointegration relationship, with the dominance of oil prices clearly evident as the primary determinant of growth. It also showed that the impact of financial inclusion is limited to the short term only, whilst it weakens and becomes insignificant in the long term, suggesting that the quantitative expansion in the opening of bank accounts in Algeria has not yet translated into productive credit contributing to structural growth. The study recommends a shift from 'quantitative' financial inclusion to 'development-oriented' financial inclusion by channelling bank liquidity towards non-hydrocarbon sectors and activating genuine financial intermediation mechanisms.

Keywords: Financial inclusion, Economic growth, ARDL model, Algeria
JEL Classification: G21, O11, C22

Introduction

Financial inclusion is receiving increasing attention globally, as theoretical literature and numerous empirical studies examining the impact of financial inclusion on economic growth have unanimously highlighted the pivotal role it can play in supporting economic growth and improving individuals' welfare, particularly among those on low incomes, as well as its potential contribution to poverty reduction. Financial inclusion refers to a situation in which various

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members of society, particularly those with irregular and low incomes, alongside economic institutions—especially microenterprises and small enterprises—are able to access a comprehensive range of financial services provided by the formal financial system, such as opening accounts, transfers, payments, credit and insurance, at an affordable cost, of adequate quality and in a sustainable manner. This access is expected to help develop economic activities, improve incomes and raise living standards, which may have a positive impact on macroeconomic performance.

However, many developing countries, including Algeria, continue to face challenges linked to the prevalence of financial exclusion and the difficulty of extending financial services to all sections of society, particularly in rural and remote areas. Nevertheless, recent years have seen the emergence of a range of reforms and initiatives aimed at promoting financial inclusion, through the development of financial infrastructure, the expansion of the use of digital financial services, the promotion of electronic payments, and the improvement of the regulatory framework supporting financial inclusion. Consequently, there is a need for a recent econometric study that allows for an impact measurement of the actual impact of financial inclusion on economic growth in light of these transformations, without any prior assumptions regarding the direction of the relationship, and in a manner that reflects the specific characteristics of the current phase of the Algerian economy. Based on the above, we can pose the following question:

What is the nature of the relationship between financial inclusion and economic growth in Algeria during the period 2004–2024?

Study Methodology

The study adopts a descriptive analytical approach to present and analyse the theoretical literature on the concept of financial inclusion, its dimensions, the various explanatory theories explaining its relationship with economic growth, and the impact transmission channels, alongside a review of the most relevant previous studies. The study also employs an **econometric approach** using statistical and econometric methods to test the nature of the relationship between variables related to financial inclusion and economic growth in Algeria, using the **ARDL model**.

Objectives of the study

This study aims to analyse the nature of the relationship between financial inclusion and economic growth in Algeria by combining theoretical, empirical and econometric analysis. It seeks to clarify the conceptual framework of financial inclusion and its dimensions, review the most important economic theories explaining the relationship between financial inclusion and economic growth, and highlight the impact transmission channels through which the impact of financial inclusion is transmitted to economic growth, as outlined in the economic literature. It also presents the most significant empirical studies that have examined this relationship. The study also aims to analyse and test the nature of the relationship between the two in Algeria in both the short run and the long run using the Autoregressive Distributed Lag (ARDL) model over the period 2004–2024, with a view to drawing and discussing the most significant findings.

Areas of Focus

This study is divided into four main areas of focus: The first area focuses on the **theoretical literature of the study**, presenting the concept of financial inclusion and its dimensions, and discussing the most important economic theories that explain the relationship between financial inclusion and economic growth, as well as the impact transmission channels. The second section presents **previous empirical studies** at both the international and local levels, highlighting the mixed results and research gaps that this study aims to address. The third section relates to **econometric studies**, covering the variables, data sources, the econometric approach employed, and the statistical methods used to test the relationship between financial inclusion and economic growth. Finally, the fourth section is devoted to **presenting and discussing the results**, linking them to the findings of the existing literature, and presenting recommendations and proposed policies to strengthen the role of financial inclusion in supporting economic growth in Algeria.

I. Theoretical Literature

I. 1. The Conceptual Framework of Financial Inclusion

Financial inclusion refers to the process of expanding access to financial services to include various economic agents, particularly individuals and small enterprises, by providing financial products and services that are tailored to their needs, at affordable prices, of high quality, and on a continuous and responsible basis. Financial inclusion contributes to strengthening the role of the formal financial system within the economy and reducing the scale of informal finance. It is the opposite of financial exclusion, which reflects the inability of certain segments of society to access the services provided by the formal financial sector, due to a range of factors, including low trust, high costs, and financial products that are unsuitable for their financing needs, as well as religious or cultural considerations[2]. The World Bank has adopted three main dimensions for measuring financial inclusion, namely[3]:

- **Access**: This reflects the ability of formal financial institutions to provide a diverse range of financial services and products, whilst also identifying the barriers individuals may face when attempting to utilise these services, such as the cost of opening and using bank accounts or geographical proximity to financial institution branches; these factors may have a positive or negative impact on accessibility.
- **Usage**: This relates to how individuals utilise the financial services and products available to them, and is measured through several indicators, including the proportion of adults holding regular deposit accounts, the proportion of adults with regular credit accounts, and the number of mobile payment transactions carried out.

[2]*Gherbi, N. (2022). Investigating the impact of financial inclusion on economicgrowth in the Maghreb countries (Algeria, Tunisia, Morocco). Journal of Business and Trade Economics, 7(1), 26–40*

[3]Alwan, S., &Beshishi, W. (2024). *The impact of the dimensions of financial inclusion on competitiveadvantage: An appliedstudy of a group of bankingagencies in the state of M'sila, Algeria*. Journal of Research in Financial and Accounting Sciences, 9(1), 207–223.

- **Quality**: This refers to the extent to which financial services meet consumers' needs and expectations, as the quality of these services is a key driver encouraging individuals to use them and remain engaged with the formal financial system.

I. 2. Explanatory theories explaining the relationship between financial inclusion and economic growth

The relationship between financial inclusion and economic growth is grounded in a theoretical legacy that explains how financial services become a driver of aggregate activity. Schumpeter's theory of financial intermediation (1911), which posits that growth is based on innovation, is one of the early intellectual frameworks explaining the pivotal role of the financial system in driving economic growth. Joseph Schumpeter emphasised that economic development is achieved primarily through innovation and entrepreneurship, and that the financial system – particularly banks – plays a crucial role in financing the innovative ventures undertaken by entrepreneurs, such as the introduction of new products or innovative production techniques. From this perspective, financial inclusion helps to broaden the base of finance beneficiaries, thereby enabling the integration of small entrepreneurs and start-ups into the production process and alleviating the credit constraints that hinder innovation. This leads to increased productivity and sustainable economic growth; thus, financial inclusion embodies the contemporary practical extension of Schumpeter's vision, whereby finance shifts from a service restricted to limited groups to a comprehensive tool for promoting innovation and growth[4]. This theory has reinforced the ideas of (King & Levine, 1993), which hold that improved access to credit and savings leads to increased investment and stimulates productive ventures, thereby boosting aggregate growth[5].

Furthermore, the financial liberalization hypothesis and financial deepening hypothesis are among the most important theoretical frameworks explaining the relationship between the development of the financial sector and economic growth; they emerged primarily in the 1970s with the works of (McKinnon, 1973) and (Shaw, 1973). This hypothesis stems from a critique of what is termed financial repression, whereby the state intervenes excessively in the financial sector by setting interest rates, restricting credit and imposing loan ceilings, leading to low savings, misallocation of resources, and a decline in investment and productivity. The hypothesis holds that financial sector liberalisation leads to financial deepening, characterised by an expansion in the volume and scope of financial services, increased savings, and improved efficiency of financial intermediation, which in turn has a positive impact on economic growth. From this perspective, financial inclusion is viewed as one of the modern outcomes of financial deepening, as it contributes to broadening the customer base in the formal financial system, increasing the mobilisation of savings, and financing productive investments, particularly in small and medium-sized enterprises, thereby promoting economic growth in the medium and long term[6].

[4]Schumpeter, J. A. (1911). The theory of economic development. Harvard University Press
[5]King, R. G., & Levine, R. (1993). *Finance and Growth: Schumpeter Might Be Right*. Quarterly Journal of Economics, 108(3), 717–737.
[6] McKinnon, R. I. (1973). *Money and capital in economic development.* Brookings Institution

As for the direction of the relationship, the thesis by (Patrick, 1966) stands out, distinguishing between two hypotheses:[7] the supply-leading hypothesis, which holds that the expansion of financial services (opening new branches, deploying ATMs, making payment applications available, etc.) precedes and stimulates growth, and the demand-following hypothesis, which holds that financial inclusion is a natural response to income growth and expanding economic activity. Some studies have demonstrated that there is bidirectional causality (Feedback Hypothesis), whereby development-oriented financial inclusion and growth form an integrated development cycle; furthermore, the validity of either hypothesis depends on the stage of development: In the early stages of economic development, such as in developing countries, the 'supply-leading' hypothesis often prevails, as banks and financial services drive economic growth. In advanced stages, such as in developed countries, the 'demand-following' hypothesis prevails, as financial innovation responds to complex market needs.

I. 3. Impact transmission channels for the impact of financial inclusion to economic growth

Based on theoretical and economic literature, a number of impact transmission channels for the impact of financial inclusion to economic growth can be identified:

- **The savings and investment channel**

Financial inclusion helps expand access to bank accounts and formal savings instruments, allowing small savings that were previously outside the financial system to be mobilised and converted into productive investments[8]. This leads to increased investment and improved capital allocation, which has a positive impact on economic growth [9] . *(Levine, 2005; Beck et al., 2007)*

- **Credit and project financing channels**

Financial inclusion helps to ease credit constraints, particularly for small and medium-sized enterprises and entrepreneurs, by facilitating access to formal finance. This boosts productive activity, stimulates job creation and supports innovation, leading to higher and more sustainable economic growth . *(Schumpeter, 1911; Beck et al., 2007)*

- **Efficiency and productivity channel**

Financial inclusion improves the efficiency of financial intermediation by reducing transaction costs and information asymmetries, particularly with the expansion of digital financial services. This contributes to the optimal use of resources and increased productivity of enterprises, thereby promoting economic growth in the medium and long term[10]. *(Levine, 2005; Sahay et al., 2015)*

- **financial stability channel**

[7] Patrick, H. T. (1966). *Financial Development and Economic Growth in Underdeveloped Economies*. Economic Development and Cultural Change, 14(2), 174–189.
[8]Levine, R. (2005). *Finance and growth: Theory and evidence*. Handbook of Economic Growth, 1, 865–934
[9]Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). *Finance, inequality and the poor*. Journal of Economic Growth, 12(1), 27–49.
[10]Sahay, R., Čihák, M., N'Diaye, P., Barajas, A., Mitra, S., Kyobe, A., Mooi, Y. N., & Yousefi, S. R. (2015). *Financial inclusion: Can it meet multiple macroeconomic goals?* IMF Staff Discussion Note.

By broadening the customer base in the formal financial system and implementing diversification of deposit sources, financial inclusion strengthens the resilience of the financial system and reduces reliance on informal finance, thereby limiting systemic risks and supporting sustainable economic growth, provided that financial expansion takes place within an effective regulatory framework. *(Sahay et al., 2015)*

- **Economic Empowerment and Aggregate Demand Channel**

Financial inclusion contributes to the inclusion of marginalized groups and improves their ability for income and risk management, leading to higher levels of consumption and human capital investment, and expanding aggregate demand, which supports inclusive growth and reduces economic disparities[11].*(Beck et al., 2007; Demirgüç-Kunt et al., 2018)*

- **The digitalization and financial innovation channel**

The development of digital financial services has strengthened the role of financial inclusion in speeding up transactions, reducing payment costs, and expanding formal economic activities. These shifts contribute to increasing the velocity of money and stimulating financial innovation, thereby promoting economic growth in both emerging and developing economies. *(Demirgüç-Kunt et al., 2018; Sahay et al., 2015)*

II. Empirical studies

Previous empirical studies examining the impact of financial inclusion on economic growth have shown marked variation in their findings, both in terms of the direction and strength of the relationship, depending on economic contexts and levels of financial development, as well as differences in the econometric approaches and financial inclusion indicators used. Whilst some studies have found a direct positive impact of financial inclusion on economic growth, others have suggested that this impact may be negative, weak, or contingent upon institutional and structural factors, or even insignificant in some cases. This reflects the complexity of the relationship between financial inclusion and economic growth and justifies further research in this area. Among these studies is:

the study by **Kim et al. (2018),** which aims to clarify the relationship between financial inclusion and economic growth in the Organisation of Islamic Cooperation (OIC) member states. In order to arrive at comprehensive and multidimensional results, panel data were constructed for 55 member states of the Organisation, and the study relied on several standard methods. Based on the results of dynamic panel estimates, the study found that the impact of financial inclusion on economic growth is positive. Furthermore, the results of impulse response functions indicated a positive impact of financial inclusion on economic growth. Granger causality tests revealed bidirectional causality between the two variables. Consequently, the study concluded that financial inclusion contributes

[11]Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The Global Findex Database 2017*. World Bank

positively to enhancing economic growth in OIC countries.[12]The study by **Suidarma (2019)** aims to analyse the impact of financial inclusion, measured by the number of automated teller machines (ATM) and commercial bank branches, on economic growth, measured by gross domestic product (GDP), in the Association of Southeast Asian Nations (ASEAN) countries during the period 2008–2015, with the aim of monitoring the impact in the post-global financial crisis period. The study employed a 'Panel Vector Error Correction Model (Panel VECM)' to examine the long-run relationship and the response of gross domestic product (GDP) to shocks in the variable measuring financial inclusion. The estimation results showed that financial inclusion, as measured by the number of automated teller machines and commercial bank branches, contributes positively to economic growth in the ASEAN region. [13] In the same vein, the study by **Siddiki & Bala-Keffi (2024)** re-examines the relationship between financial inclusion and economic growth using data from 153 countries. Despite the extensive debate regarding the role of financial inclusion in stimulating growth, empirical evidence continues to yield mixed results.

Financial inclusion, measured by account ownership with formal financial institutions or mobile money service providers, is a fundamental pillar for integrating unbanked segments of the population into the formal economy, thereby promoting inclusive economic growth. The analysis revealed that the relationship between financial inclusion and economic growth is positive, but varies in strength and impact depending on each country's levels (thresholds) of financial development. The magnitude and impact of this relationship differ across countries according to the level of development of their financial sectors, highlighting the importance of designing financial inclusion policies to suit the financial sector's stage of development. The results also revealed that the impact of financial inclusion and financial development vary according to income levels, geographical regions, and the economic fragility of countries. [14] This study represents a significant contribution, as it draws on a large sample (153 countries) and offers an explanation for the 'inconsistency' in the results through the concept of 'thresholds'. Building on these studies, the most recent research deepens our understanding of this relationship and clarifies the multidimensional impact of financial inclusion, as demonstrated in the study by **Hasan et al. (2026),** which aimed to analyse the impact of financial inclusion on a set of key socioeconomic variables, namely economic growth, financial stability and income inequality, during the period preceding the COVID-19 pandemic. The study constructed a composite Financial Inclusion Index (FII) based on a multidimensional framework encompassing indicators of availability, usage and penetration. The analysis covered a sample of 60 developing countries over the period 2005–2019, and the results showed that financial inclusion contributes significantly to promoting

[12]Kim, D.-W., Yu, J.-S., & Hassan, M. K. (2018). *Financial inclusion and economic growth in OIC countries*. Research in International Business and Finance, 43, 1–14. https://doi.org/10.1016/j.ribaf.2017.07.178

[13]Suidarma, I. M. (2019). *The nexus between financial inclusion and economic growth in ASEAN.* Journal of Economics and Policy Jejak, 12(2), 267–281. https://doi.org/10.15294/jejak.v12i2.18747

[14]Siddiki, J., & Bala-Keffi, L. R. (2024). *Revisiting the relation between financial inclusion and economic growth: A global analysis using panel threshold regression.*Economic Modelling, 135, 106707. https://doi.org/10.1016/j.econmod.2024.106707

economic growth, particularly through improved access to banking services, whilst no statistically significant relationship was found between financial inclusion and financial stability. Conversely, the results suggest that higher levels of financial inclusion may lead to a widening of the income inequality gap, due to unequal access to financial services and the unequal distribution of their benefits. By adopting a standardised financial inclusion index and applying it to three macroeconomic variables using a fixed sample and methodology, the study provides comprehensive insights into the multidimensional impact of financial inclusion in developing economies.

The findings underscore the need to adopt policies that enhance access to finance, strengthen financial literacy, and encourage responsible lending, to ensure that financial inclusion contributes to inclusive and stable economic development. [15] In a more detailed context, recent studies have not limited themselves to examining the direct impact, but have moved on to analysing the moderating factors of this impact. A study by **Isayev (2026)** the moderating role of non-bank financial intermediation (NBFI) (such as insurance companies, investment funds, and finance companies, as a moderating variable) in the relationship between financial inclusion and economic growth. It drew on panel data for 26 countries covering the period 2010–2021, constructing a composite index of financial inclusion whilst incorporating broad and narrow measures of non-bank financial intermediation to reflect its diverse and varied characteristics. The results confirmed that financial inclusion significantly boosts economic growth, particularly in developing economies, whilst non-bank financial intermediation also contributes to economic expansion; however, its presence (whether broadly or narrowly defined) tends to mitigate and weaken the positive impact of financial inclusion on economic growth. This mitigating effect is clearly evident when using the narrow measure of non-bank financial intermediation in countries with medium to high levels of development. Furthermore, Dumitrescu-Hurlin causality tests (a highly advanced panel data method for testing causality in the presence of heterogeneity across countries) revealed a bidirectional causal relationship between financial inclusion, non-bank financial intermediation, and economic growth. These findings point to the need to adopt policies that promote financial inclusion whilst ensuring that non-bank financial intermediation contributes to supporting the impact of financial inclusion on growth rather than undermining it.[16] Contrary to the prevailing view emphasising a positive impact, a study by **Yakubu et al. (2025)** revealed a statistically significant negative impact of financial inclusion on economic growth in sub-Saharan African countries, attributing this to weak institutional controls. The study drew on data from 33 countries using the System GMM methodology, and the results showed that institutional quality contributes positively to growth, and that the interaction between it and financial inclusion reinforces this effect.

[15]Hasan, A. N., Ibrahim, M., & Salim, K. (2026). *Financial inclusion and macroeconomic outcomes in developing economies: Pre-COVID insights on growth, stability, and inequality.*Future Business Journal, 12, 30. https://doi.org/10.1186/s43093-026-00729-5

[16]Isayev, M. (2026). *Financial inclusion and economic growth: The role of non-bank financial intermediation.* International Review of Economics and Finance, 105, 104829. https://doi.org/10.1016/j.iref.2025.104829

In contrast, both banking stability and inflation had a negative impact on growth. The study emphasises that realising the benefits of financial inclusion requires a strong institutional framework, which calls on policymakers to adopt effective regulatory and supervisory mechanisms to mitigate the associated risks.[17] Contrary to the previous studies (both positive and negative), the study by **Muvunyi & Batóg (2025)** also sought to verify the expected positive impact of financial inclusion on economic development in a group of European economies during the period 2014–2023. This was done using standard models and composite indicators developed by the researchers; however, the results indicated no clear relationship between the degree of financial inclusion and economic development among EU member states, and it was found that the impact of financial inclusion differed between European countries before and after the COVID-19 pandemic. Nevertheless, the study emphasises the need for caution when interpreting these results, given the presence of a structural break resulting from the 2020 economic recession and the relatively small sample size. It is evident that in highly developed countries, some of the standard variables used to measure financial inclusion are inappropriate or insufficient, as these countries have moved beyond this stage to advanced digital services. The study's findings make it possible to identify the conditions necessary to maximise the positive and sustainable impact of financial inclusion on the economy and to reduce disparities in development levels between different countries.[18] This study challenges the bias towards a permanent positive effect. Research at the local level in Algeria is not immune to this international and regional divergence; indeed, the transition from global studies to the reality of the Algerian economy reveals a similar divergence in the findings and in the econometric approaches employed. Whilst some local studies have concluded that the impact of financial inclusion on economic growth is positive, others have pointed to negative or essentially insignificant relationships, reflecting the specific nature of Algeria's economic and institutional reality. These divergent results highlight the urgent need to re-examine the relationship between financial inclusion and economic growth using more up-to-date data and more rigorous methodological approaches. The following are some local studies that have also addressed this relationship. The study by **Hlaili et al. (2023)** examined the impact of financial inclusion on economic growth in Algeria using a vector auto regression (VAR) model for the period 2007–2019. Financial inclusion was measured by two indicators: the volume of domestic loans and the volume of deposits, whilst economic growth was represented by gross domestic product (GDP). The study concluded that there is a strong correlation between financial inclusion variables and economic growth, suggesting that the expansion of credit provision and deposit mobilisation largely explain changes in Algeria's gross domestic product (GDP) during the study period.[19] In the same vein, the study by **Boughazi & Cherakrak**

[17]Yakubu, I. N., Yussif, A. R., & Abdul-Rahaman, M. (2025). *The impact of financial inclusion on economic growth: Does institutional quality matter?* In *Strategic approaches to banking business and sustainable development goals* (pp. 117–128). Springer.

[18]Muvunyi, E., & Batóg, J. (2025). *Financial inclusion and sustainability of economic development: Empirical results from selected EU member states.*Sustainability, 17, 8237. https://doi.org/10.3390/su17188237

[19]Hlaili, N., Madrous, N., & Benbouziane, F. Z. (2023). *The impact of financial inclusion on economic growth in Algeria*. Journal of Economic and Management Research, 4(1), 80–95.

(2025) sought to measure the impact of financial inclusion on economic growth in Algeria during the period 2000–2023, using annual data on financial infrastructure indicators (number of commercial bank branches and number of automated teller machines). The study employed the Autoregressive Distributed Lag (ARDL) model to examine the nature of the relationship in the short run and the long run. The results indicated a long-run equilibrium relationship between the study variables, showing that the expansion of the bank branch network and the increase in the number of automated teller machines contribute positively and significantly to stimulating growth rates in the Algerian economy.[20]Meanwhile, the study by **Hammoumi et al. (2022)**, which examined the impact of financial inclusion on economic growth in Algeria, focusing on the role of traditional banking channels, using the ordinary least squares (OLS) method, It reached mixed conclusions: whilst a positive relationship was found between economic growth and each of the following (the number of commercial bank branches, the number of automated teller machines, and the volume of bank credits), the results revealed a paradox in the form of a statistically significant negative relationship between the volume of deposits and economic growth. The study attributed this negative effect to the low efficiency of converting deposits into productive investments within the banking system, which hinders the contribution of savings to stimulating economic activity and growth." [21] As for the study by **Gherbi (2022),** which examined the nature of the relationship between financial inclusion and economic growth in the Maghreb countries (Algeria, Tunisia, Morocco) during the period 1990–2019, using panel data ARDL (Autoregressive Distributed Lag) time-series models and relying on the Financial Access Index as the independent variable and gross domestic product (GDP) as the dependent variable, whilst including financial development and total investment as control variables. The results found no statistically significant relationship between financial inclusion and economic growth, either in the short run or the long run, in the sample countries. The study attributed this finding to the fact that the levels of financial inclusion achieved in these countries remain below the threshold required to have a positive impact on growth; furthermore, the results did not reveal any significant impact of financial inclusion on the overall level of financial development in the region."[22]

A comprehensive review of the existing literature reveals a fundamental divergence and widespread academic debate regarding the impact of financial inclusion on economic growth. This inconsistency in findings clearly reflects that the impact of financial inclusion is not a simple linear phenomenon, but rather a complex process influenced by structural specificities and the econometric methodologies employed.

[20]Boughazi, H., & Cherakrak, S. (2025). *The impact of financial inclusion on economic growth in Algeria during the period 2000-2023*.Journal of Economic Sciences, Management and Commercial Sciences, 81(20), 806–826.
[21]Hammoumi, W., Ben Azzah, M., & El Ayati, J. (2022). Evaluating the role of financial inclusion in stimulating economic growth: An econometric approach to the case of Algeria. Journal of Economics and Sustainable Development, 5(1), 764–783.
[22]Gherbi, N. (2022). Investigating the impact of financial inclusion on economic growth in the Maghreb countries (Algeria, Tunisia, Morocco). Journal of Business and Trade Economics, 7(1), 26–40

III. The econometric study

III. 1. The model used

The model equation will be as follows:

$$GDP = f(DEPOSIT, PP, INF)$$

This model seeks to explain economic growth in Algeria by incorporating the key financial variable that reflects financial inclusion, alongside a set of control variables that capture the structural characteristics of the Algerian economy. Economic growth was measured **by per capita real gross domestic product (GDP)** as an indicator reflecting the actual expansion of economic activity, net of price effects. The main independent variable is the **number of bank accounts (DEPOSIT),** which reflects the extent of the use of financial services, with the aim of measuring the degree of integration of individuals and institutions into the formal financial system.

To isolate the net effect of financial inclusion, a set of control variables was included. The first of these—given the rentier nature of the Algerian economy—is **oil prices (PP)** as a control variable to capture the impact of external shocks linked to energy market fluctuations, thereby preventing the impact of financial inclusion from being inaccurately inflated or understated. Finally, the **inflation rate (INF)** was included not as a correction for price changes — given the use of per capita real output — but rather for impact measurement, namely the impact of price stability on savings, confidence in the financial system, and the efficiency of financial intermediation, factors which may indirectly influence the relationship between financial inclusion and economic growth.

The proposed model thus reflects an integrated analytical framework consistent with the specific characteristics of the Algerian economy and provides a more accurate benchmark for estimating the actual impact of financial inclusion on economic growth during the period under study.

The model can be written in its general form, resulting in the following equation:

$$GDP_t = C + C_1 DEPOSIT_t + C_2 PP_t + C_3 INF_t + \varepsilon_t$$

Where:

GPD: Per capita share of real gross domestic product
DEPOSIT: Number of bank accounts
PP: Oil price
INF:Inflation rate
ε_t: Random error term in period *t*

III. 2. Study Sample and Time Period

The study sample is Algeria. The study period spans from 2004 to 2024.

III. 3. Data Sources:

The data used to estimate the model consists of annual data for the period (**2004–2024**), drawn from the International Monetary Fund (IMF)[23] and the World Bank[24] (WDI).

III. 4. Steps for estimating the model and presenting the results

To estimate the model, we will use the autoregressive time-lag model with distributed lags.

III. 4.1. Estimation of the standard model using the Autoregressive Distributed Lag (ARDL) model

III. 4.1.1. Testing the stationarity of time series:

Table 1: Results of the Augmented Dickey-Fuller test and the Phillips-Perron test:

Variable	Difference	PP.ADF				
		ADF Calculated Value	Critical Value at 5%	PP Calculated Value	Critical Value at 5%	Decision
GDP	GDP	-2.1693	-3.0206	-2.1652	-3.0206	Do not reject H_0
	D(GDP)	-3.7547	-3.0299	-3.7547	-3.0299	Reject H_0
DEPOSIT	DEPO	-2.4764	-3.0206	-2.4764	-3.0206	Do not reject H_0
	D(DEPO)	-4.9899	-3.0299	-6.0386	-3.0299	Reject H_0
PP	PP	0.2006	-1.9614	-0.8616	-1.9590	Do not reject H_0
	D(PP)	-6.5375	-1.9614	-13.5953	-1.9601	Reject H_0
INF	INF	-3.9984	-3.0299	-0.8543	-1.9590	Do not reject H_0
	D(INF)	–	–	-4.7539	-1.9601	Reject H_0

Source: Prepared by the researcher based on Eviews 9 outputs

The ADF and PP tests indicate that the null hypothesis—that the variables do not have a unit root—cannot be rejected; however, this hypothesis can be rejected for their first differences. This implies that the variables are integrally of order (1).

$$\Delta VarU_{dif} = \alpha + \beta_1 VarU_{dif_{t-1}} + \beta_2 VarY_{dif_{t-1}} + \sum_{i=1}^{P} \gamma_1 \Delta VarY_{dif_{t-1}} + \sum_{i=1}^{q} \gamma_2 \Delta VarU_{dif_{t-1}} + \varepsilon_t$$

$$\Delta VarU_{gap} = \alpha + \beta_1 VarU_{gap_{t-1}} + \beta_2 VarY_{gap_{t-1}} + \sum_{i=1}^{P} \gamma_1 \Delta VarY_{gap_{t-1}} + \sum_{i=1}^{q} \gamma_2 \Delta VarU_{gap_{t-1}} + \varepsilon_t$$

[23] https://www.imf.org/
[24] www.banquemondiale.org/

III. 4.1.2. Bounds testing methodology for testing cointegration:

$$\Delta GDP_t = \alpha + B_1 GDP_{t-1} + B_2 DEPOSIT_{t-1} + B_3 PP_{t-1} + B_4 INF_{t-1} + \sum_{i=1}^{p} y_1 \Delta DEPOSIT_{t-p} + \sum_{i=1}^{p} y_2 \Delta GDP_{t-p} + \sum_{i=1}^{p} y_3 \Delta PP_{it-p} + \sum_{i=1}^{p} y_4 \Delta INF_{it-p} + \varepsilon t$$

The F-statistic for testing the presence of a cointegration relationship, first and foremost:

H_0 :$\beta_1=\beta_2=\beta_3=\beta_4=0$: The null hypothesis, which implies the absence of a relationship between the variables

H_1 :$\beta 1\neq\beta 2\neq\beta_3\neq\beta_4\neq 0$: The alternative hypothesis posits the existence of a long-run cointegration relationship between the levels of the model's variables.

Table 2: Bounds test for the existence of a long-run cointegration relationship

ARDL Bounds Test		
Date : 24/03/2026 Time : 23 :14		
Sample : 2004-2024		
Included observations : 18		
Nul Hypothesis : No long-run relationship Exist		
Test Stastic	**Value**	**K**
F.Statistic	28.47309	3
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Source: Prepared by the researcher using EVIEWS 9.

Based on the table above, proposed by Pesaran, Shin, & Smith (2001) at significance levels of 5% and 10% [25], the Fisher's F-statistic (F=28.47) at K=3 (number of independent variables) indicates that it is greater than the upper limit of the critical table values at all significance levels.This confirms the rejection of the null hypothesis stating that there is no cointegration between the variables. We accept the alternative hypothesis and thus the existence of a long-run equilibrium relationship between per capita gross domestic product, the number of bank accounts, the oil price, and inflation.

[25]Pesaran, M. H., Shin, Y., & Smith, R. J. (2001).*Bounds testing approaches to the analysis of level relationships.*Journal of Applied Econometrics, 16(3), 289–326. https://doi.org/10.1002/jae.616

III. 4.1.3. Estimation of the long-run equilibrium relationship:

Having confirmed the existence of a cointegration relationship between the dependent variable and the independent variables, we estimate the model parameters in the long run, as shown in the following table:

Table 3: Estimation of long-run parameters

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
DEPOSITAC	-4.42E-05	2.69E-05	-1.646239	0.1983
PP	31.47895	6.450793	4.879857	0.0165
INF	-65.86368	53.20087	-1.238019	0.3038
C	7760.476	1023.695	7.580850	0.0048

Source: Prepared by the researcher using EVIEWS 9.

Table 3 shows the regression results explaining the per capita gross domestic product (GDP) using the following independent economic variables: number of bank accounts, oil price, and inflation. We observe that there is a statistically significant positive relationship between the oil price and per capita GDP, meaning that a $1 increase in the oil price is associated with a $31.47 increase in per capita gross domestic product. We also observe a negative but non-significant relationship between inflation and per capita gross domestic product, indicating that the impact of inflation was weak in explaining economic growth during the period under study. The bank accounts coefficient also indicates a negative impact on per capita gross domestic product in the long run; however, this impact is not statistically significant, meaning that it is not possible to confirm the existence of an impact of financial inclusion on economic growth in the Algerian economy in the long run.

III. 4.1.4. Error Correction Model (ECM ARDL):

This stage involves estimating the model parameters in the short run, as shown in the following table:

Table 4: Results of the error correction model estimates for the ARDL model

ECM Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPKK(-1))	-0.378576	0.066033	-5.733102	0.0105
D(GDPKK(-2))	0.810243	0.053723	15.08176	0.0006
D(DEPOSITAC)	1.26E-05	2.18E-06	5.774352	0.0103
D(DEPOSITAC(-1))	-3.61E-05	2.54E-06	-14.22946	0.0008
D(PP)	5.235487	0.278675	18.78705	0.0003
D(PP(-1))	-1.499149	0.245706	-6.101390	0.0088
D(PP(-2))	-2.827643	0.235553	-12.00425	0.0012
D(INF)	13.13795	2.668654	4.923062	0.0161
D(INF(-1))	31.06441	2.953401	10.51818	0.0018
D(INF(-2))	-47.39964	4.122607	-11.49749	0.0014

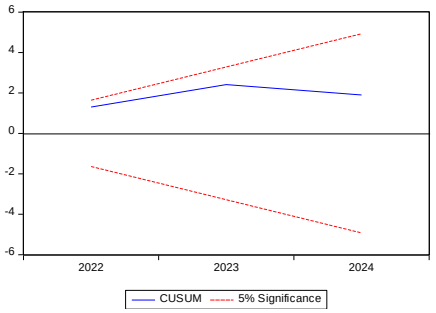
CointEq(-1)*	-0.352444	0.019337	-18.22597	0.0004

Source: Prepared by the researcher using EVIEWS 9.

We can see from the results in the table that the error correction coefficient is negative and statistically significant (-0.3524), indicating that there is a correction process from the short run to the long run to return to the long-run equilibrium. In other words, 35% of the deviation of GDP from its long-run equilibrium level will be corrected each year. We also note that all coefficients of the independent variables in the short term (whether their lags or their current values) were statistically significant at a level below 5%, with the variable representing the impact of financial inclusion showing a statistically significant positive effect in the short term, whilst oil prices and inflation exhibited mixed effects.Ranging from positive to negative depending on the lag periods, reflecting the sensitivity of economic growth in Algeria to short-term fluctuations in these variables prior to long-run stability.

III. 4.1.5. Model stability test:

Figure 1: Cumulative sum test of the autoregressive residuals



Source: Prepared by the researcher using EVIEWS 9.

Structural stability of the estimated coefficients for the error correction term of the **ARDL** model is achieved if the **CUSUM** test plot falls within the critical limits. It is evident from the results of this test in **(Figure 1)** that there is stability and consistency in the model between the long-run and short-run results, and that the variables are stable over time; consequently, the ARDL model is the ideal model on which to rely for analysing and interpreting the results.

III. 4.1.6. Breusch-Pagan-Godfrey Heteroskedasticity Test:

Table 5: Breusch-Godfrey test for serial correlation.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.609995	**Prob. F(2,1)**	0.4010

Source: Prepared by the researcher using EVIEWS 9.

The Breusch-Godfrey test was performed to check for autocorrelation in the model's residuals. The results showed that Fisher's p-value of 0.4010 is greater

than 0.05, so we accept the null hypothesis that there is no serial autocorrelation of errors in the studied model.

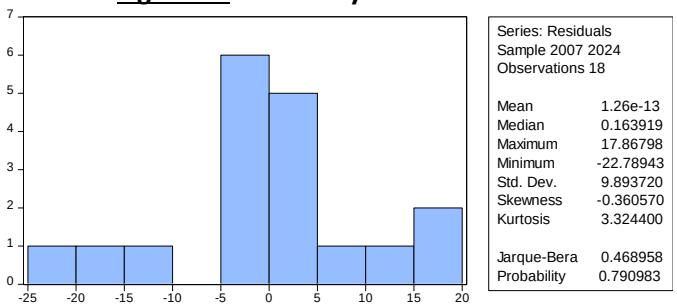
Table 06: Heteroskedasticity Test for constant error variance

Heteroskedasticity Test: ARCH			
F-statistic	0.675458	**Prob. F(1,15)**	0.4240
Obs*R-squared	0.732532	**Prob. Chi-Square(1)**	0.3921

Source: Prepared by the researcher based on the EVIEWS 9 programme.

The error variance consistency test, which shows whether the errors are homogeneous or not, was also conducted. Its results showed that the P-value of 0.4240 and 0.3921 for Fisher and X^2, are greater than 0.05, from which we accept the null hypothesis that the error variance is homogeneous and constant.That means the variables are independent of each other and there is no linear correlation between them.

Figure 02: normality test of residuals



Source: Prepared by the researcher based on the EVIEWS 9 programme.

H_0: The random error follows a normal distribution.
H_1: The random error does not follow therandom distribution.

We can see from the figure that the probability of 0.7909 is greater than 0.05, so we reject the alternative hypothesis and accept the null hypothesis and thus the random errors follow a normal distribution.

III. 5. Discussion of Results

- The confirmation of the existence of the cointegration relationship indicates that financial inclusion in Algeria (as measured by the number of bank accounts) is not just a passing phenomenon. The very high score (28.47) reflects the close cohesion between the banking system and productive activity; despite the external shocks to the Algerian economy such as oil price fluctuations (PP), there is an internal equilibrium mechanism that ensures that gross domestic product per capita returns to its stable path thanks to the expansion of the financial base. This proves that the efforts made in reforming the Algerian banking system during the study period may have been effective in creating a solid platform to support banking stability and growth.

- **The long-run estimation results show** a clear variation in the role of the independent variables in explaining economic growth in Algeria, and these results can be analysed as follows:

1. **Dominance of oil shocks:** The results show that the oil price is the main and only significant driver of economic growth in Algeria. As the increase in the price of a barrel by one dollar leads to an increase in per capita output by 31.48 dollars, this confirmsthe continued dependence of the Algerian economy on the hydrocarbon sector. Oil revenues fuel government spending and aggregate demand, which is directly reflected in per capita income, marginalising the impact of other variables, including financial inclusion.
2. **The paradox of financial inclusion:** Despite the existence of an equilibrium relationship (according to the bounds test), the effect of the number of bank accounts was negative and insignificant. This result,although statistically strange, is very logical in the Algerian case, as the increase in the number of bank accounts did not necessarily turn into 'productive credit' that stimulates growth, and this may be due to what is called 'passive savings', i.e. opening accounts may be for the purpose of consumption only and not investment. Algerian banks (especially public ones) have high liquidity but are very cautious in private sector lending. It may also be due to the shadow economy, i.e. the preference for dealing in cash outside the banking system, making the increase in accounts a mere administrative procedure that does not contribute to the real economic cycle.
3. **impact of inflation:** The impact of inflation is negative but insignificant, indicating that inflation in Algeria during the study period did not reach levels that severely hinder growth, or that the negative impact of inflation is absorbed through government price subsidies, making it a variable that does not directly affect real GDP per capita.

- As for the short-term results , we observe that:

1. The impact of financial inclusion on growth is positive and significant in the very short run. This means that the opening of bank accounts in Algeria is immediately accompanied by an increase in economic activity, perhaps due to the facilitation of payments or the localisation of wages that stimulate aggregate consumption. However, this impact fades or becomes insignificant in the long run (as we saw earlier), suggesting that the impact of financial inclusion in Algeria is more consumption-oriented inclusion than investment inclusion.
2. The instantaneous effect of oil prices is very strong (5.23), confirming that the initial growth impulse in Algeria always comes from oil revenues, which inject immediate liquidity into the economic arteries.
3. Inflation in the short run is positive and significant, which can be economically explained by the fact that the Algerian economy may experience growth driven by an increase in aggregate demand accompanied by a slight rise in prices, or that inflation reflects an increase in expansionary government spending that stimulates growth only momentarily.
4. The value of the error correction coefficient (-0.35) means that the Algerian economy takes about three years (2.8) to fully return to equilibrium after a shock (such as a sudden drop in oil prices). This speed is considered moderate to fairly good and indicates that Algeria's economic and financial policies have the capacity to absorb imbalances and return growth to its normal, stable path.

Conclusion

This study analysed the impact of financial inclusion on economic growth in Algeria during the period (2004-2024), using the ARDL model. The results showed the existence of a long-run equilibrium relationship between the study variables. However, the nature of this relationship largely reflects the specificity of the Algerian economy and the structural challenges it faces, mainly related to dependence on the hydrocarbon sector. The main findings can be summarised as follows:

- Financial inclusion in Algeria contributes to stimulating economic growth **in the short term**, but this effect fades in the long term, in light of the dominance of hydrocarbon revenues in economic activity. This highlights the need to move from quantitative financial inclusion based on expanding the base of bank accounts, to development-oriented financial inclusion aimed at channelling financial resources towards productive sectors outside the non-hydrocarbon sectors, in order to support sustainable economic growth.
- The poor **long-term** significance of financial inclusion reflects that the mere availability of financial services is not enough to achieve economic growth. Rather, it is necessary to enhance the efficiency of the use of these services and directing savings towards productive investments instead of keeping them in the form of unutilised balances within the banking system.
- The Algerian economy has a moderate ability to rebalance after shocks, in a period that reflects the degree of responsiveness of economic policies, especially in light of the continuous oil price fluctuations in international markets.

Based on the above, the study recommends the following:

- Activating the role of the banking system in channelling deposits towards financing productive investments, especially for small and medium-sized enterprises.
- Enhancing confidence in the banking system in order to attract the money supply circulating outside official channels.
- Accelerating the pace of digital transformation in the financial sector, developing banking services and creating real investment opportunities for individuals.

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