

The Role of Institutional Quality in Finance- Growth Nexus : Empirical Evidence from Algeria (1980-2023)

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Abstract:

This article studies the effect of financial development on economic growth through the quality of institutions. Using a cointegration approach based on the autoregressive distributed lag (ARDL) model over the period from 1980 to 2023, the results obtained show that the direct effect of financial development on growth is negative. Moreover, the effect of financial development on economic growth becomes positive and significant when financial development is conditioned by the level of institutional development. This means that the quality of institutions contributes to the improvement of the effect of financial development on economic growth in Algeria. We recommend that the authorities try to improve the quality of institutions by creating favorable conditions for the fight against corruption, better bureaucracy, and political stability, which will contribute to the development of the financial system.

Keywords: Financial development; Economic growth ; Quality of institutions ; ARDL.

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I- Introduction:

The Finance–Growth Nexus has been a principal element of macroeconomics since Schumpeter (1911) found that financial systems have an advantage in mobilizing savings, allocating resources, and creating innovations. This theory has been reinforced by McKinnon (1973) and Shaw (1973) in their hypothesis on financial liberalization and is generally supported in developed countries where there are adequate legal and regulatory measures for a statistically significant and positive relationship between development of finances and long-term economic growth (King and Levine, 1993; Beck et al., 2000). However, with the study of this law on developing and emerging countries, its simple interpretation has faced serious questions due to ambiguous and negative impact in countries having structural rigidities and weak governance, thus, resulting in emergence of ‘conditional finance–growth hypothesis’ (Demetriades & Law, 2006; Arcand et al, 2015).

In the New Institutional Economics tradition, this particular view focuses on the fact that institutional quality is one of the most important mediating variables affecting the economy and lowering market risk (North, 1990). The presence of strong institutions such as adherence to the rule of law, good quality of regulation, anti-corruption measures, and assurance of property rights is crucial in ensuring the effectiveness of resource allocation (Acemoglu et al., 2005; Law & Azman-Saini, 2012). Therefore, according to the findings, weak institutions might lead to financial deepening resulting in macroeconomic problems namely, overextension of credit while good institutions support the positive influence of financial development on economic performance (Minsky, 1986; Samargandi et al., 2015).

Although general world information is available on this topic, it remains necessary to conduct specific research on resource-based and bank-oriented economies undergoing structural changes, such as Algeria. Even though Algeria is attempting to carry out gradual reforms in finance and institutions despite problems with governance, regulatory quality, and financial market sophistication, its economic growth continues to be unstable. The study focuses on utilizing the framework of institutional quality in order to ensure more effective analysis of the ways through which financial development can contribute to a better economic performance of Algeria.

To achieve this objective, the study adopts an Autoregressive Distributed Lag (ARDL) modelling approach, which is particularly appropriate for investigating both long-run and short-run dynamics in small samples and in the presence of variables integrated at different orders. Furthermore, by introducing an interaction term between financial development and institutional quality, the analysis directly examines whether institutions function as a catalyst or, alternatively, as a constraint within the finance–growth nexus.

Accordingly, the study seeks to address the following key research questions:

- (i) to what extent does financial development exert a statistically significant long-run effect on economic growth in Algeria?
- (ii) Do institutional quality play an important role in enhancing economic growth?
- (iii) How fast short-run adjustments react to economic shocks?

By addressing these issues, the study contributes to the literature in three important respects. First, it provides updated and long-span empirical evidence for Algeria covering the period 1980–2023, thereby responding to calls for country-specific analyses in resource-dependent and institutionally evolving economies. Second, the study advances the finance–growth literature by explicitly modelling the interaction between financial development and institutional quality, offering empirical support for the conditional finance–growth hypothesis. Third, the findings yield policy-relevant insights for resource-based economies, demonstrating that financial development can serve as an effective engine of sustainable growth only when accompanied by improvements in institutional quality and governance structures.

1. The theoretical framework of the study.

The relationship between financial development and economic growth cannot be explained solely by focusing on economic aspects. It is the institutional aspect that acts as the catalyst for this relationship to transform into a genuine synergy between financial development and economic growth. This is a prerequisite. Algeria cannot escape this condition. We will attempt to define this issue from a theoretical perspective, then project it onto the case of Algeria.

1.1. The Major Determinants of Financial Development

1.1.1 Presentation of theories linking the legal and institutional framework as an explanatory factor for the level of financial development

Two theories explain financial development through the quality of institutions. The first is the law and finance theory, which argues that the legal origin of a country's judicial system (Anglo-Saxon, French, German, or Scandinavian) influences the level of financial development because different legal traditions provide varying degrees of protection for private property rights and investors (La Porta & al., 1998, pp. 1115–1123; Beck, Demirgüç-Kunt, & Levine, 2003, pp. 654–657). The second is the initial endowments theory, developed by Acemoglu, Johnson, and Robinson (2001), which suggests that the geographic and health conditions faced by European settlers in colonized territories shaped the institutional structures established during colonization and, consequently, the quality of contemporary institutions (Acemoglu & al., 2001, pp. 1370–1375).

1.1.2 Political and Economic Factors

1.1.2.1 Pressure Group Theory

Rajan and Zingales (2003) developed an influential framework that explains financial development as a process shaped by economic and political conflicts of interest. Their interest group theory argues that trade openness alone, without corresponding financial openness, is unlikely to foster financial development (Rajan & Zingales, 2003, pp. 8–12). According to the political economy perspective, powerful interest groups may exert pressure on governments to secure rents and privileges at the expense of other economic actors. Consequently, governments that primarily serve the interests of specific groups may have limited incentives to promote financial development, since a more developed financial system could increase competition and weaken the privileged position of incumbent interests (Rajan & Zingales, 2003, pp. 17–22)

1.1.2.2 Political instability

Political instability leads to uncertainty about the profitability of financed projects and can increase defaults. It becomes less attractive for entrepreneurs to invest in long-term projects. Instead, they invest in short-term projects, resulting in low demand for finance. Furthermore, banks will tend to finance only short-term investments in order to recoup their investments as quickly as possible.

1.1.3 Economic factors

We find :

- **Economic growth :** Following endogenous growth theories, numerous studies have emphasized the causal relationship between financial development and economic growth. Many scholars support the view that financial development acts as a catalyst for economic growth. In this regard, Schumpeter (1912) highlighted the crucial role of the banking system in promoting economic development. According to his analysis, banks facilitate the allocation of credit toward productive investments, thereby fostering technological innovation, capital accumulation, and sustained economic growth (Schumpeter, 1912, pp. 73–74).
- **Inflation :** Financial development is an important channel through which inflation can negatively affect economic growth. High inflation generally signals significant macroeconomic instability and generates information imperfections and uncertainties about the profitability of investment projects. If the inflation rate is too high, banks' resources decrease, investment stagnates, and economic growth is dragged down. Inflation reduces not only the level of investment but also the efficiency with which production factors are used (Alice & François, 2016, pp. 45–47).

1.1.4 Structural factors and financial development

We find :

- **State interventionism hinders financial development:** Development theory considers that this state interventionism allows for a better allocation of credit, since the State is better placed than private banks to make more efficient use of it. However, the experience of other developing countries has shown that public control has rather caused financial disintermediation and capital flight. That is to say, the State exploits the financial system to serve its political objectives to the detriment of the development objectives originally assigned to it (Shleifer & Vishny, 1994, pp. 1010–1015).
- **Financial development and the establishment of foreign banks**

Levine (1996) argues that foreign banks can contribute significantly to financial development by introducing higher-quality financial services into domestic markets, enhancing competition within the banking sector, and exerting downward pressure on the cost of financial services. Through these mechanisms, foreign bank participation can improve financial efficiency and facilitate a more effective allocation of resources within the economy (Levine, 1996, pp. 31–35).

1.1.5 Other determinants of financial development

In addition to institutional, political, economic, and structural factors in explaining the mechanisms by which they affect financial development, there are also other variables that could be considered determinants of financial development. Income level, culture, religion,

and social capital are identified as determinants of financial development. Although these have not attracted as much interest as the other determinants, they should not be neglected.

1.2 Effects of financial development via institutional quality on economic growth: literature review

Let's remember, classical macroeconomic theories (Schumpeter, 1911; McKinnon, 1973; Shaw, 1973) view the financial sector as a driving force behind economic growth of the country due to the fact that it provides better resource allocation and decreases transaction costs. However, modern literature shows that the nature of the link between economic growth and financial development tends to be very complex and depend on certain structural and environmental thresholds. Despite rather straightforward concept of financial deepening, empirical evidence indicates that some indicators of macroeconomic stability (e.g., low initial inflation (Azariadis & Smith, 1996)) and structural features of the economy (e.g., high level of social trust (Galindo et al., 2001) and effective legal systems that can protect borrower's rights (Levine, 1999) stimulate development of financial markets while lack of indirect regulation, especially for countries with limited development or high influence of government in the economy (La Porta et al., 2002; Beck et al., 2003) restrains the further growth in the banking sector. Furthermore, historical determinants of finance such as standards and practices of colonial period significantly impact the development of financial system (Beck et al., 2003).

Based on these structural dynamics, a predominant viewpoint has come forward recognizing institutional quality to be the major moderating factor as well as a necessary condition for efficient financial development. Research works that examine institutional factors specifically such as the rule of law, corruption control, and bureaucratic efficiency have shown that improvements in political and institutional areas lead to significant improvements in financial depth (Huang, 2010; Alice & Kamajou, 2016; Azzouz & Baroudi, 2016), notably when these improvements co-exist with trade and financial openness (Demetriades & Law, 2004). This relationship is one of the threshold nature and as shown by Law, Azman-Saini, and Ibrahim (2013) financial development does not bring positive results for economic growth unless a known threshold of institutional quality is reached. If the threshold is not reached or there is any other structural misallocation like high degree of ethnic fragmentation (Avoutou, 2019), then the financial system performs efficiently restricting savings being invested into productive investments.

The complexities evident in theoretical and structural aspects appear in recent regional empirical analyses in developing and resource-rich countries. In the MENA region, it was identified that there exists a two-way causal link between banking and economic development, and it becomes quite strong in countries with good institutional quality (Nabi et al., 2008). This conclusion is supported by findings from the GCC illustrating that the effective institutions make a meaningful contribution to the financial development (Al-Senani et al., 2025). Well-documented results in North Africa (Sghaier, 2021) and oil-poor Arab countries (Yahyaoui et al., 2021) indicate that financial reforms might not result in having a positive economic impact unless they are accompanied by institutional changes allowing the financial system to be able to function properly. On the contrary, West African countries represent a negative example as weak and inefficient institutions result in a

negative impact on banking (Olaniyi & Oladeji, 2021) proving that in the absence of good regulatory institutions there will be issues related to misallocation of credit, financial frauds, and poor banking supervision.

2. The experimental framework for the study.

Our research question is to verify whether there is a relationship between the development of financial systems, institutional quality, and economic growth in Algeria. In this context, we empirically explore this hypothesis by introducing an interaction term between institutional development and the financial development variable.

In our study, the Auto Regressive Time Lag (ARDL) model of Pesaran et al. (2001) was used for the econometric analysis of the data. The statistical analysis of the time series was performed using Stata 12.0 software.

The ARDL (Auto Regressive Distributed Lags) model developed by Pesaran et al. (2001) is a flexible econometric method for analyzing both long-term (cointegration) and short-term relationships between variables. Unlike traditional methods (Engle-Granger, Johansen), which require all series to be integrated of the same order [I(0) or I(1)] and are better suited for large samples, the ARDL approach:

- Allows working with series of different orders of integration [I(0) or I(1), but not I(2)].
- Provides efficient estimates with small samples.
- Combines long-run dynamics (tested via the "bounds test") and short-run adjustments (via an Error Correction Model, ECM) in a single model.
- Can be applied even when there is only one long-run relationship and can identify multiple cointegrating vectors.

Key steps in its implementation are:

- Ensure no series is I(2) (using ADF/PP unit root tests).
- Select the optimal lag length (using AIC, SC criteria).
- Perform the "bounds test" to check for cointegration.
- Estimate the ARDL-ECM model for short- and long-term relationships.
- Validate the model through diagnostic and stability tests.

In the article, this approach is used to study the relationship between financial development and economic growth in Algeria integrating institutional development, as it overcomes the limitations of other methods when dealing with series that are not integrated of the same order.

1. Empirical model

We will follow the approach of Gregory & al (1992), Demetriades & Law (2004). We formulate the growth equation which considers the quality of institutions as well as its interaction with financial development (INS*FD):

$$\text{Growth}_t = \alpha_0 + \alpha_1 \text{FD}_t + \alpha_2 \text{INS}_t + \alpha_3 \text{FD}_t * \text{INS}_t + \alpha_4 \text{X}_t + \varepsilon_t$$

To determine whether the quality of institutions has improved the relationship between financial development and economic growth, we study the estimated coefficients of the long-term equation (Christophe, Luc, & Edward, 2015):

- If $\alpha_1 > 0$ and $\alpha_3 > 0$ then financial development has a positive effect on economic activity, and the quality of institutions favorably affects (improves) this impact.
- If $\alpha_1 > 0$ and $\alpha_3 < 0$ then financial development has a positive effect on economic activity, and the institutional level adversely affects (reduces) this impact.
- If $\alpha_1 < 0$ and $\alpha_3 < 0$ then financial development has a negative effect on economic activity, and the institutional level favorably affects (aggravates) this impact.
- If $\alpha_1 < 0$ and $\alpha_3 > 0$ then financial development has a negative effect on economic activity, and the institutional level mitigates this impact.

Under the assumption that $\alpha_3 > 0$, we can calculate the threshold level of the institution variable beyond which financial development accelerates real growth.

Applying first-order conditions ($\partial \text{Growth}_t / \partial \text{FD}_t \geq 0$), we have:

$$\alpha_1 + \alpha_3 \text{FD} * \text{INS}_t \geq 0 \text{ and therefore } \text{INS}_t \geq -\alpha_1 / \alpha_3$$

Where t denotes the period, Growth_t is the growth rate of real gross domestic product per capita (GDP), FD is an indicator of financial development, INS is a synthetic index that measures institutional development, X is the set of control variables, $\text{FD} * \text{INS}$ the interactive variable composed of the product of financial development and the level of institutional development, α_0 and ε_t represent the constant and the error term, respectively.

2. Presentation of the model variables

We examine annual data for Algeria over the period from 1980 to 2023. Our endogenous variable is the annual growth rate of real GDP per capita. The explanatory variables include control variables, indicators of financial development, and institutional measures. The source of each variable is presented in Appendix 1.

2.1 Control Variables

Based on a review of the theoretical and empirical literature, we selected five control variables likely to represent the macroeconomic environment: the inflation rate (INF), calculated by the consumer price index (CPI); the trade openness variable (TRADE), measured by the ratio of exports and imports to GDP; the government consumption variable (GOV), calculated by the ratio of real government consumption to GDP; the investment rate to GDP (INV), which provides information on the gross fixed capital formation of all economic agents (government, businesses, and households); and the secondary school enrollment rate, which provides information on the stock of human capital (HC).

2.2 The Financial Development Index (FD)

We will use three indicators to construct our composite measure (ACP). The first is the ratio of money supply to GDP (M2), which provides information on the size of the banking market relative to the economy. The second indicator is the commercial bank asset ratio, denoted (CBA). This ratio is equal to the value of commercial bank assets to the total assets of commercial banks and the central bank. Thus, the third indicator is the ratio of credit allocated to the private sector by commercial banks and other non-bank financial institutions (as a % of GDP), denoted (Credit). (The calculation of FD index through PCA method is presented in Appendix 3)

2.3 The Institutional Development Index (INS)

We retain five of the six indicators collected from the Worldwide Governance Indicators (“WGI”, 2023) database. The data on the quality of institutions are observed over the period (1996-2023), they indicate values rated between -2.5 and +2.5 (from poor to good quality). The PCA method was also used to construct the institutional and legal development index (INS). We constructed this INS indicator from the following institutional indicators (Alice & François, 2016):

- ✓ **The quality of bureaucracy (or government effectiveness) (BQ):** measuring the competence of the bureaucracy and the quality of public service delivery.
- ✓ **Political stability and absence of violence (PS):** measuring the likelihood of violent threats to, or changes in, government, including terrorism.
- ✓ **Control of corruption (COR):** measuring the exercise of public power for private gain, including both petty and grand corruption and state capture.
- ✓ **Law and Order (LOR):** measuring political, civil and human rights.
- ✓ **The weight or quality of regulation (QUAREG):** the government's capacity to formulate and implement strong policies and regulations to ensure better supervision of financial activities to promote private sector development.

Institutions should play an active role in the development of the financial system. To verify this, we estimate the relationship between financial development, economic growth, and institutional development. This method will allow policymakers to determine which aspects of governance need to be addressed and to establish adequate institutions capable of providing public goods and social services in a stable environment in order to reduce poverty and ensure sustainable growth.

2.4 Empirical results and interpretations

2.4.1 Unit root tests

To examine the stationarity of the variables, we will apply the augmented Dickey-Fuller test (Dickey and Fuller, 1979). Given the insignificance of the trend and the constant, the unit root test was performed without trend or constant. The results of the ADF test show that the variables FD, INS, FD*INS, INF, Trade, GOV and INV are stationary in first difference, i.e., integrated of order 1 $I(1)$, while the two variables Growth and HC are stationary at level $I(0)$. Therefore, no series is integrated of order two $I(2)$ or higher, which justifies the application of the ARDL.

TABLE (1): Augmented Dickey-Fuller (ADF) stationarity test

Stationarity test			
	Level	1 st difference	Order of Integration
Growth	-8.433***	-3.034	$I(0)$
FD	-1.029	-3.055***	$I(1)$
INS	-1.542	-3.086***	$I(1)$
FD*INS	-1.741	-3.153***	$I(1)$
INF	-1.830	-5.537***	$I(1)$
Trade	-1.544	-4.712***	$I(1)$
GOV	-1.579	-4.283***	$I(1)$
INV	-1.247	-3.272***	$I(1)$

HC	-6.292***	-2.618	I(0)
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➤ *Notes:* The null hypothesis of the test is: a series has a unit root. The rejection of the null hypothesis is at the 5% level of significance. (*) Significant at 10%; (**) Significant at 5% and (***) Significant at 1%.

Source: calculations performed on data using Stata 12.0 software.

2.4.2 Determining the Optimal Lag

To select the number of lags, we used the Schwarz Information Criterion (SC), as shown in the table below. According to the Schwarz Information Criterion, we will choose the ARDL model (1,1, 1, 1, 1, 1, 2, 1, 1) that corresponds to the smallest SC value.

Table (2): Determining the Optimal Lag

Variables	0	1	2	3	4
Growth	4.64811	4.40944*	4.48314	4.56877	4.64561
FD	3.69556	1.01587*	1.03012	1.12453	1.20211
INS	8.36152	6.63664*	6.64968	6.74912	6.84726
FD*INS	3.71799	1.04802*	1.06264	1.15941	1.23473
INF	7.21604	6.10315*	6.15279	6.24688	6.31575
Trade	7.63326	6.16939*	6.21202	6.28726	6.36763
GOV	4.88869	3.78416	3.71017*	3.78839	3.88692
INV	6.52901	6.24674*	6.34572	6.36279	6.41713
HC	8.37028	7.33872*	7.38604	7.48628	7.57262

Notes: *, **, and *** indicate rejection of the null hypothesis at the 10%, 5%, and 1% level, respectively.

Source: calculations performed on data using Stata 12.0 software.

2.4.3 Determining the existence of the cointegration relationship (Bound Test)

To study the existence of a long-term relationship between economic growth and financial development combined with the quality of institutions. This leads us to the cointegration test of Pesaran & al (2001) using the new bounds test procedure. The results of the bounds test procedure below show that the Fisher statistic ($F = 4.259$) is greater than the upper bound for the different significance thresholds 1%, 2.5%, 5% and 10%, respectively (4.20), (3.69), (3.29) and (3.01). Therefore, we reject the hypothesis H_0 of absence of long-term relationship and we confirm by the presence of a long-term relationship between the different variables in our model.

Table (3): Cointegration test « bounds test »

F-statistique	Significance	I(0)	I(1)
4.259***	10%	1.95	3.01
	5%	2.22	3.29
	2.5%	2.48	3.69
	1%	2.79	4.20

Notes: *, **, and *** indicate rejection of the null hypothesis at the 10%, 5%, and 1% level, respectively.

Source: calculations performed on data using Stata 12.0 software.

2.4.4 Statistical validation of the model used

Diagnostic tests were carried out to assess the robustness of the model used and to avoid falling into spurious regressions, namely: the Breusch–Godfrey (LM) autocorrelation test, the White heteroscedasticity test, the Jarque-Bera (JB) test for the normality of the

residuals, and finally the Ramsey functional form test (RESET). In the following (Table 4) the results of these tests:

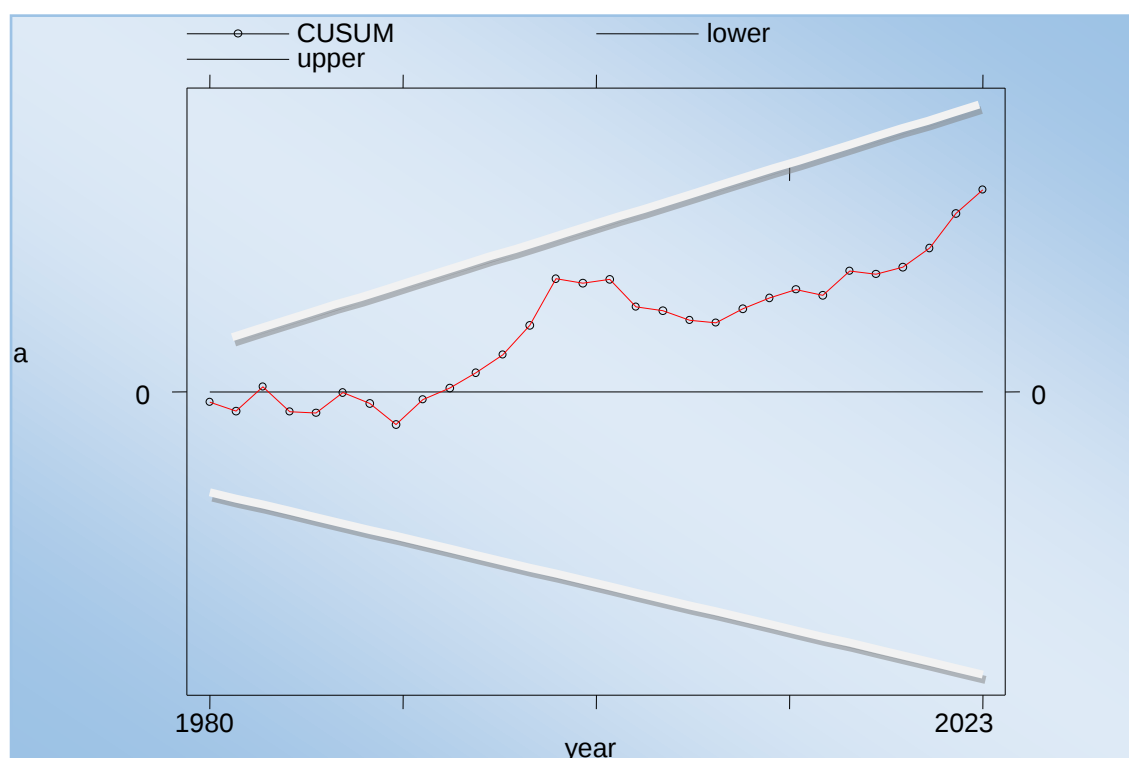
Table 4 : Statistical validation of the model used

Test hypothesis	Tests	Probability
Autocorrélation	Breusch–Godfrey (LM)	0.9728
Hétéroscédasticity	White	0.3895
Normality	Jarque-Bera	0.05879
Spécification	Ramsey (RESET)	0.0825

Source: calculations performed on data using Stata 12.0 software.

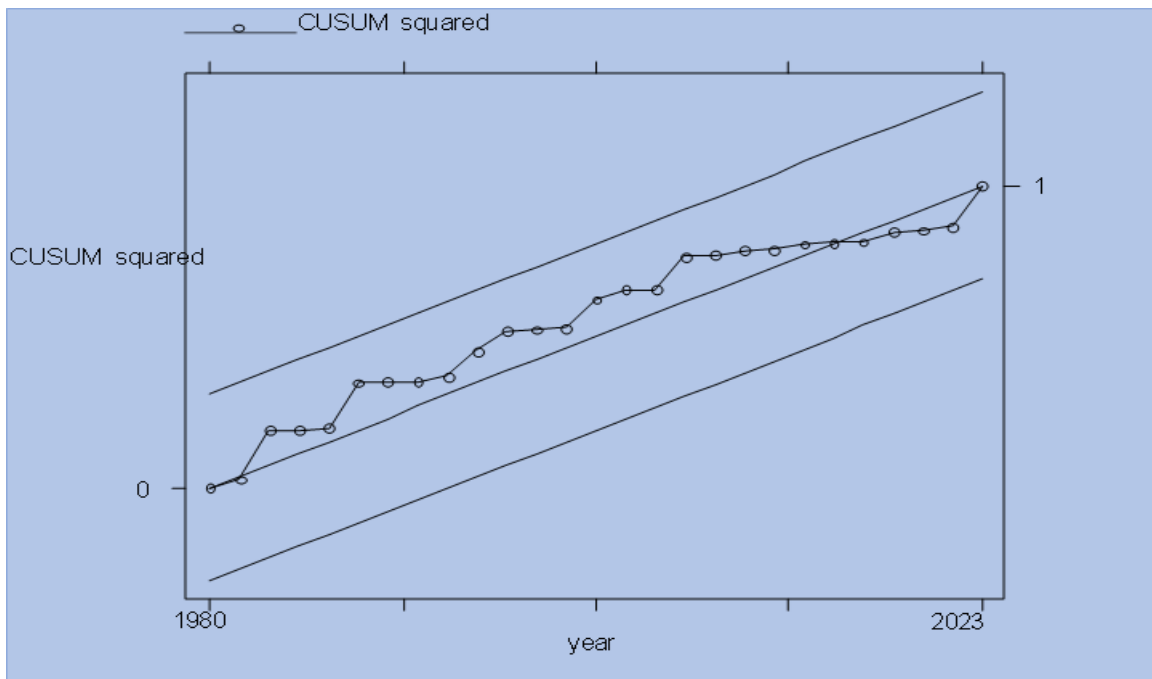
The results of the validation tests of this model confirm the absence of serial correlation ($0.9728 > 0.05$), the absence of heteroscedasticity ($0.3895 > 0.05$), and the normality of the residuals ($0.05879 > 0.05$). Alternatively, the functional form of our specifications is correct ($0.0825 > 0.05$). Furthermore, The CUSUM test indicates that the estimated coefficients are stable throughout the period 1980–2023, as the CUSUM curve remains within the critical bounds. Therefore, there is no evidence of structural instability or structural breaks in the model, confirming the robustness of the estimated parameters over the study period. The CUSUM of Squares test indicates that the model is stable over the period 1980–2023. Since the CUSUM of Squares curve remains within the critical bounds throughout the sample period, the null hypothesis of parameter stability cannot be rejected. Therefore, there is no evidence of structural instability or sudden changes in the variance of the residuals.

Graph (1): Curve of the cumulative sum of residuals



Source: calculations performed on data using Stata 12.0 software.

Graph (2): Cumulative sum of squared residual curve



Source: calculations performed on data using Stata 12.0 software.

Indeed, multicollinearity phenomena can exist, leading to estimation difficulties (Erkel-Rousse, 1995, pp. 4–7), meaning different series expressing the same thing. The study of multicollinearity will allow us to avoid the tautology of exogenous variables through correlation coefficients, but does not exclude the possibility of collinearity. The correlation matrix shows that all coefficients are less than 0.5 (Appendix 2). Therefore, we conclude that there is no multicollinearity between the different explanatory variables. (Descriptive statistics are presented in Appendix 3).

On the other hand, Multicollinearity among the explanatory variables was examined using the Variance Inflation Factor (VIF). This diagnostic assesses whether any predictor in the ARDL model is highly correlated with others, a condition that can inflate standard errors and reduce the precision of the coefficient estimates. The VIF results show that most variables have values below the conventional threshold of 5, indicating that multicollinearity is not a substantial issue in the model.

Table 5: Variance Inflation Factor (VIF) results

Variables	VIF
Growth	-
FD	3.75
INS	1.89
FDINS	4.18
INF	3.86
Trade	2.12

Gov	4.45
Inv	3.16
Edu	1.14

Source: calculations performed on data using Stata 12.0 software.

2.4.5 Estimating the long-term relationship

The bounds cointegration test confirms the existence of a cointegration relationship between the variables under study, which makes it possible to estimate the long-term effects between the variables. Table 5 below summarizes the estimation results of the long-term parameters or elasticities, which are estimated by the ARDL approach.

Table (6): Estimating the long-term relationship

Variables	Coefficient	Prob
FD	-0.0871432	0.023**
INS	-1.181419	0.031**
FDINS	0.0319829	0.002*
INF	-0.0373626	0.772
Trade	0.1249442	0.012**
GOV	- 0.7214208	0.047**
INV	0.147184	0.098***
HC	0.0010349	0.653
C	-15.17497	0.017*
Cointq = Growth – (-0.0871432*FD - 1.181419*INS + 0.0319829* FDINS - 0.0373626*INF+0.1249442*Trade - 0.7214208*GOV + 0.147184*INV + 0.0010349*HC-15.17497)		

Source: calculations performed on data using Stata 12.0 software. Note: *, ** and *** indicate significance at 1 %, 5 % and 10 % levels, respectively.

The estimation results of the relationship between financial development, institutional quality, and economic growth presented in the table above confirm the positive impact of trade openness on economic growth. Specifically, a 1% increase in the trade openness rate is associated with a 0.12% increase in economic growth. This finding is consistent with the work of Edwards (1998), who demonstrates that reducing restrictions on imports and exports contributes to higher economic growth rates (Edwards, 1998, pp. 383–387). Economies that are more integrated into international trade benefit from access to larger markets, greater competition, technological diffusion, and more efficient resource allocation, all of which foster economic growth (Edwards, 1998, pp. 388–390).

The coefficient associated with government consumption (GOV) is negative and statistically significant. A one-point increase in GOV leads to a 0.72% decrease in economic growth. This result is consistent with Barro and Sala-i-Martin (1995), who show that higher public spending may crowd out private investment by increasing the tax burden required to finance government expenditure, thereby reducing incentives for private sector investment (Barro & Sala-i-Martin, 1995, pp. 517–520).

At the same time, the coefficient of the investment variable (INV) is positive and statistically significant, indicating a favorable impact on economic growth in Algeria. A 1% increase in the investment rate leads to a 0.14% increase in per capita income. This result is expected, as investment plays a central role in stimulating economic growth by supporting firm creation, technology adoption, unemployment reduction, and overall productivity gains.

On the other hand, the coefficient of the inflation variable (INF) negatively and insignificantly influences economic growth. The same is true for human capital (HC); it plays no role in the evolution of economic growth. However, the sign of the synthetic index associated with the quality of institutions is negative and significant for our study. This result leads us to reflect on the weakness of the institutional environment in our country (corruption, weak protection of property rights, weak rule of law, bureaucracy, rigidity of the financial system), which has generated risk aversion among economic agents toward the financial system. Indeed, the financial system reforms initiated since the early 1990s have not been accompanied by sound institutional reforms adequate to the implementation of new measures and the functioning of the new system.

Regarding the synthetic index of financial development (DF), we found that financial development has a negative impact on economic activity in Algeria. The negative effect of financial development on economic growth is significant due to the low level of institutional development in Algeria given the range of the composite index (-2 and -1). This is why it has an unfavorable contribution to economic growth.

Now we turn to the indirect effect of financial development on economic growth through institutional quality, captured by the interaction term (FDINS). The coefficient of this interaction term highlights the role of institutions in shaping the finance–growth nexus. Specifically, a one-unit increase in (FDINS) is associated with a 0.08% change in economic growth, while institutional quality reduces this adverse effect by 0.03%. Overall, financial development and institutional quality appear to be complementary in promoting economic growth, as a sound institutional environment provides the foundation for efficient financial intermediation and sustainable development. In this regard, institutional quality can be considered a fundamental determinant of both financial and economic development (Acemoglu, Johnson, & Robinson, 2001, pp. 1370–1375).

These results are consistent with those of Beck, Demirgüç-Kunt, and Levine (2003) and La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998), who emphasize that a sound institutional and legal environment strengthens the impact of financial development on

economic growth (Beck et al., 2003, pp. 654–657; La Porta et al., 1998, pp. 1115–1120). The results also support those provided by Gazdar (2011), who finds a negative impact of both banking sector development and financial market development on economic growth in MENA countries, while also showing that institutional quality mitigates this negative effect in the region (Gazdar, 2011, pp. 45–48).

These results lead us to question the existence of an optimal threshold beyond which the institutional framework improves the effect of financial development on economic growth in Algeria. The threshold will be determined using the estimated coefficients of the long-term equation.

The results in the table below show that the average value of institutional quality in Algeria is -0.1, which is below the threshold of 1.92 $[-(-0.0871432/0.0319829)=2.72]$. Financial development only becomes beneficial to economic growth from a level of institutional development equivalent to 2.72. This can be justified by the fact that Algeria has not implemented a phased financial liberalization which requires the prior establishment of strong institutional infrastructures. The institutional and regulatory framework in Algeria is of poor quality implying financial underdevelopment. However, adequate institutional quality would contribute to financial development and improve its impact on economic growth. On the contrary, a deficient institutional framework leads to distortions in the performance of financial intermediaries and hinders economic growth.

Considering the quality of institutions in the relationship between financial development and economic growth plays a fundamental role in explaining the impact of financial development on economic growth. In other words, financial development only promotes economic growth in the presence of quality institutions. In other words, financial development can only be beneficial to economic growth beyond a certain threshold of institutional development.

Table (7) : Calculation of the average institutional development and comparison with the threshold level

Financial Variable (FD)	Variable financière d'interaction (DF*INS)	Average institutional development	Institutional development threshold to be reached
-0.0871432	0.0319829	-0.10	2.72

Source: calculations performed on data using Stata 12.0 software.

2.4.6 Estimating the Short-Term Relationship

To study the short-term effects of financial development via institutional quality on economic growth in Algeria, we estimate error correction regression.

Table (8): Result of the short-term estimation

Variables	Coefficient	Prob
D(FD)	0.0322456	0.325
D(FD (-1))	-0.1047032	0.256
D(INS)	0.8923145	0.120
D(INS(-1))	-1.0248252	0.030**
D(FD*INS)	-0.0032473	0.570
D(FD*INS(-1))	0.0649894	0.001*
D(INF)	-0.0911236	0.243
D(INF(-1))	0.2368952	0.869
D(Trade)	0.0986258	0.325
D(Trade(-1))	0.1834523	0.102
D(GOV)	-0.1325623	0.325
D(GOV(-1))	0.9191951	0.032**
D(GOV(-2))	-0.1179038	0.456
D(INV)	0.1985553	0.020**
D(INV(-1))	0.0422698	0.325
D(HC)	-0.002256	0.542
D(HC(-1))	0.0123375	0.897
CointEq(-1)	-1.272065	0.000*
R ²	0.8607	
F-statistic	5.08	0.0010***

Source: calculations performed on data using Stata 12.0 software. Note: *, ** and *** indicate significance at 1 %, 5 % and 10 % levels, respectively.

The short-term result in the table above also shows that the error correction coefficient CointEq (-1) is negative and significant at the 1% level. This guarantees the existence of an error correction mechanism. Indeed, the coefficient CointEq (-1) represents the speed of adjustment towards long run equilibrium. The value of -1.272065 is significant ($p = 0.000$), indicating a rapid adjustment short-term imbalances. In fact, 127% of the previous year's imbalances are corrected during the current year, suggesting a good speed of adjustment in the relationship process following a shock in the previous year.

The short-term result in the table above also shows that the synthetic index of financial development (FD) has a non-significant effect. This means that financial development does not cause economic growth in the short term. However, the variable measuring the quality of institutions appears with a negative and significant sign. This result can be explained by the poor quality of the institutional framework in Algeria. Taking into account the interaction between financial development and the synthetic index of the quality of institutions (FD* INS), the results show that this measure positively influences economic growth. This means that the quality of institutions actually affects economic growth, but through its financial system and not directly.

In addition, we find that the coefficient associated with government consumption (GOV) of the previous year has a positive and statistically significant impact on economic growth in the current year. On the other hand, the other control variables did not show the expected (significant) effects in the short term. The trade openness rate (Trade) does not show any significant coefficient in our model. Human capital (HC) has no role to play in economic growth. The same goes for inflation (INF); it plays no role in the evolution of economic growth. The coefficient of the investment variable (INV) has no significant influence on economic growth.

Table 7 shows that our model is statistically validated since the probability associated with the F statistic is less than 5%. Moreover, it is of good quality since the value of the R2 statistic is 0.86.

2.4.7 Causality test of Toda-Yamamoto

The Toda-Yamamoto Granger causality test is primarily designed to determine the *direction* of causality between variables. In contrast, the ARDL framework is focused on uncovering long-run and short-run dynamics like cointegration and error-correction. While ARDL can be adapted for causality testing, the Toda-Yamamoto method is fundamentally structured as a direct test of causal precedence, making it the more dedicated tool for this specific purpose.

Table 9: Toda-Yamamoto Causality Test results

Dependent variables	Causal variables									Results
	Growth	FD	INS	FD*INS	INF	Trade	GOV	INV	HC	
Growth	-	1.2474 (0.0691)	4.3385 (0.785)	9.1512 (0.0886)	7.2941 (0.2734)	8.0927 (0.0630)	5.7242 (0.1258)	3.3807 (0.0543)	2.5817 (0.3366)	FD*INS → Growth FD → Growth Trade → Growth
FD	5.0385 (0.0786)	-	1.0937 (0.5543)	9.1513 (0.2354)	3.3893 (0.6921)	1.0978 (0.8878)	0.1257 (0.3029)	2.5898 (0.7265)	5.0927 (0.6572)	Growth → FD
INS	2.2236 (0.2112)	3.2121 (0.9987)	-	8.2562 (0.7729)	4.2566 (0.5621)	7.2121 (0.1189)	4.5582 (0.2362)	4.2036 (0.3636)	5.2323 (0.3959)	No causality
FD*INS	1.8479 (0.6046)	4.2332 (0.8558)	0.3585 (0.3862)	-	4.25222 (0.3636)	8.3210 (0.8781)	5.2525 (0.9878)	2.2323 (0.5252)	2.2858 (0.2978)	No causality
INF	1.8479 (0.4046)	2.0882 (0.9881)	15.351 (0.5855)	8.2269 (0.6281)	-	6.1752 (0.0364)	5.0232 (0.9974)	0.2365 (0.2855)	6.0202 (0.2902)	Trade → INF
Trade	4.5260 (0.3100)	4.2555 (0.8635)	6.2555 (0.6652)	7.2654 (0.2562)	2.2322 (0.5858)	-	8.2302 (0.2314)	3.1414 (0.2999)	0.9102 (0.2903)	No causality
GOV	0.4434 (0.2266)	5.7242 (0.1518)	4.4212 (0.7879)	9.9989 (0.7454)	4.8988 (0.7882)	2.2215 (0.9898)	-	4.2565 (0.2222)	5.3256 (0.5851)	No causality
INV	5.0332 (0.9059)	7.1116 (0.3902)	6.2387 (0.7457)	7.2565 (0.2221)	0.5859 (0.4242)	3.2565 (0.1287)	9.2252 (0.2020)	-	0.2123 (0.2230)	No causality
HC	3.7456 (0.5571)	5.5362 (0.7786)	4.2325 (0.1129)	4.2333 (0.3245)	1.2223 (0.8987)	1.8741 (0.2219)	8.3669 (0.8414)	8.9633 (0.5747)	-	No causality

Source: calculations performed on data using Stata 12.0 software

Table 9 displays the outcomes of the Toda-Yamamoto causality analysis, indicating the following directional relationships:

- **FD*INS → Growth:** A unidirectional causal link runs from the interaction of financial development and institutional quality (FD*INS) to economic growth. This suggests that financial development and robust institutions are complementary in

driving growth, as a sound institutional framework provides the foundation for effective financial development, which in turn fosters economic expansion.

- **Growth ↔ FD:** A bidirectional causality exists between economic growth and financial development (FD). This mutual relationship indicates that growth in the financial sector stimulates the economy, while rising economic output, in turn, promotes further financial development. The financial system contributes to growth by channeling savings into productive investments, and increased real GDP per capita subsequently fuels greater financial activity.
- **Trade → INF:** A unidirectional causality runs from trade openness (Trade) to inflation (INF). Trade openness can influence inflation through two primary channels: increasing the supply of imported goods (which may lower prices) and exposing the economy to exchange rate pass-through effects (which may raise prices). The ultimate impact depends on other factors, including monetary policy, trade regulations, and Algeria's specific macroeconomic context.
- **Trade → Growth:** A unidirectional causal relationship is found from trade openness (Trade) to economic growth (Growth). This implies that openness to international trade stimulates growth by creating new opportunities and facilitating cross-border commerce.

Conclusion

In this article, we empirically examined the relationship between financial development and economic growth in Algeria, while taking into account the impact of the institutional environment. To do this, we applied an autoregressive model with staggered lags (ARDL) over the period from 1980 to 2023. The results confirm the existence of a negative impact of financial development on economic growth in Algeria. On the other hand, the effect of financial development on economic growth becomes positive and significant when financial development is conditioned by the level of institutional development. This means that improving the quality of institutions can significantly reduce the negative impact of banking sector development on economic growth. Furthermore, given the positive impact of the quality of institutions on financial development and consequently economic growth, Algeria should take the necessary measures to provide an appropriate institutional framework, reform the legal and financial systems and provide an effective legal system based on the rule of law, capable of strengthening the protection of property rights, protecting the rights of creditors and ensuring that contracts are strictly enforced, thereby strengthening investor confidence.

In order to achieve a level of financial development that will enable improved growth and economic development, we believe it is necessary to:

- Implement necessary reforms aimed at improving the flow of information, developing appropriate accounting standards, diversifying credit products, improving debt collection mechanisms, and strengthening incentives for contract compliance.
- Strengthen the financial market by reducing constraints on financial asset transactions.

- Focus on improving competition within the banking sector, privatizing public banks, and diversifying financing sources to meet the needs of various economic agents.
- Improve the institutional framework by creating favorable conditions to combat corruption, improve bureaucracy, and foster political stability, which will contribute to the development of the financial system.
- Strengthen the impact of trade openness on economic growth by supporting increased exports, particularly non-hydrocarbon exports.
- Limit government interference in the operation of financial institutions and limit excessive oversight that hinders their performance, and prevent these institutions from granting loans to companies that support politicians.
- Ensure the modernization and openness of the Algerian financial system to the outside world to cope with rapid changes in the global economy.
- Establish a more competitive domestic investment climate and create the conditions for a favorable and less restrictive economic environment for foreign investment.
- Take measures to combat informal economic activities.
- Implement an effective recovery and modernization plan for the Algiers Stock Exchange to create an appropriate environment that supports its development and allows it to fulfill its role in stimulating economic growth.

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Appendix 1: Presentation of variables

	Variable	Description	Source
Financial Variables	M2	Money supply M2 to GDP ratio	Financial structure and development data set
	DBA	The ratio of commercial bank assets to the total assets of commercial banks and the central bank	
	CREDIT	The ratio of domestic credit allocated to the private sector by banks as a percentage of GDP	
	FD	The synthetic index of financial development using the principal component analysis method	Authors' calculations
	FD*INS	The interactive variable composed of the product of financial development and the level of development of institutions	
Control Variables	Growth	The annual growth rate of real GDP per capita	
	Trade	The trade openness variable, measured by the ratio of exports and imports to GDP	
	GOV	The government consumption variable, calculated by the ratio of real government consumption to GDP	

Variables of institutional development	INF	The inflation rate, calculated by the consumer price index (CPI)	World Development Indicators
	INV	The investment rate to GDP, which provides information on the gross fixed capital formation of all economic agents (government, businesses, and households)	
	EDU	The secondary school enrollment rate, which provides information on the stock of human capital	
	BQ	The quality of bureaucracy (or government effectiveness)	World Wide Governance Indicators (WGI), Kaufmann et al (2018)
	PS	Political stability and absence of violence	
	COR	Control of corruption	
	LOR	Law and Order	
	QUAREG	The weight or quality of regulation	
	INS	The synthetic index of institutional development using the principal component analysis method	Authors' calculations

Appendix 2: Principal Components. Analysis (PCA)

```
. pca m2 credit dba
```

```
Principal components/correlation      Number of obs   =      40
                                      Number of comp. =       3
                                      Trace             =       3
Rotation: (unrotated = principal)    Rho              =    1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.11662	1.31909	0.7055	0.7055
Comp2	.797534	.71169	0.2658	0.9714
Comp3	.0858434	.	0.0286	1.0000

```
Principal components (eigenvectors)
```

Variable	Comp1	Comp2	Comp3	Unexplained
m2	-0.3920	0.9198	0.0181	0
credit	0.6486	0.2902	-0.7037	0
dba	0.6525	0.2641	0.7103	0

Source: calculations performed on data using Stata 12.0 software

Appendix 3: Principal Components. Analysis (PCA)

```
. pca politicalstabilityandabsenceofvi governmenteffectiveness regulatoryquality ruleoflaw controlofcorruption
```

```
Principal components/correlation      Number of obs   =      21
                                      Number of comp. =       5
                                      Trace              =       5
                                      Rho               =      1.0000

Rotation: (unrotated = principal)
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.51631	1.59236	0.5033	0.5033
Comp2	.923953	.243314	0.1848	0.6881
Comp3	.680639	.130529	0.1361	0.8242
Comp4	.55011	.221125	0.1100	0.9342
Comp5	.328985	.	0.0658	1.0000

```
Principal components (eigenvectors)
```

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
politicals~i	0.5481	0.0642	0.0147	0.2257	-0.8027	0
government~s	0.5050	0.1455	-0.1653	0.6415	0.5339	0
regulatory~y	-0.3355	0.7213	0.5211	0.2993	-0.0776	0
ruleoflaw	0.3927	0.6210	-0.2279	-0.6238	0.1383	0
controlofc~n	0.4216	-0.2622	0.8056	-0.2426	0.2135	0

```
. predict ins
```

Source: calculations performed on data using Stata 12.0 software

Appendix 4: Test de multicollinéarité des variables explicatives

Variables	Growth	FD	INS	FDINS	INF	Trade	GOV	INV	EDU
Growth	1.0000								
FD	-0.2327	1.0000							
INS	-0.2324	0.2177	1.0000						
FDINS	-0.4584	0.1232	0.2997	1.0000					
INF	-0.2342	0.3249	0.3245	0.0002	1.0000				
Trade	0.3479	-0.0381	0.2655	0.0716	-0.0396	1.0000			
GOV	-0.2351	0.0161	0.0161	0.0392	0.0663	0.2462	1.0000		
INV	-0.0437	0.1780	0.0780	0.3093	-0.1212	0.033	0.1748	1.0000	
EDU	0.2828	-0.0796	-0.2096	0.1758	-0.3758	0.2250	0.1418	-0.23051	1.0000

Source: calculations performed on data using Stata 12.0 software.

Appendix 5: Descriptive statistics

Variables	Mean	Sta.Dev	Min	Max
Growth	0.7610144	2.407458	-4.32603	5.93742
FD	9.1742562	1.454862	-2.82057	1.852168
INS	-2.44.2565	2.104987	-3.319035	2.120548
FDINS	2.150197	1.867324	-2.873352	5.523743
INF	8.864287	8.235113	0.339163	31.6697
Trade	57.1241	10.24578	32.6846	76.6845
Gov	16.71241	2.378239	11.2316	21.5603
Inv	13.90893	3.308304	0.00001	24.6201
Edu	66.26928	19.28402	30.0352	99.8602

Source: calculations performed on data using Stata 12.0 software.