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CHIAD, Faycal and Aouissi, Amine and Lahsasna, Ahcene

Department of Finance, Ferhat Abbas Sétif University 1, Department of Economics, Ferhat Abbas Sétif University 1, Salihin Shariah Advisory

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Financial Market Inclusion and Economic Growth: Evidence from Algeria

Faycal Chiad

Department of Finance, Ferhat Abbas Sétif University 1, Algeria

Email: faychi04@yahoo.fr

Amine Aouissi

Department of Economics, Ferhat Abbas Sétif University 1, Algeria

Email: amine.aouissi@univ-setif.dz

Ahcene Lahsasna

Salihin Shariah Advisory

Email: lahsasna@gmail.com

Abstract: In this paper, we investigated the relationship between financial inclusion (FI), trade openness (TO), human development (HD), and GDP growth in Algeria. Our data set covers annual times series data from 1980 to 2018. The autoregressive distributed lag (ARDL) bounds test was used to examine the cointegration between variables due to mixed orders of integration I(0) and I(1).The results indicate that financial inclusion, trade openness, human development have a positive and significant impact on economic growth in the short and long-run, thereby confirming the strength of the finance-growth connections. Granger-causality test confirms that there is bi-directional causality between financial inclusion and economic growth.

Keywords: Financial inclusion, Economic Growth, ARDL, Algeria

1. Introduction

Gladstone (1958) proclaims the importance of finance for the economy: "Finance is, as it were, the stomach of the country, from which all the other organs take their tone.*"*(Bank, n.d.) A global initiative at the beginning of 2010 conduct by G20 and World Bank, to support financial inclusion in emergent countries and help them abate poverty and improve financial services for all individuals and businesses (GPFI, 2011). (Martinez, 2011)noted that governments used financial access asan important policy to dynamize GDP growth, and their ability to reallocate productive resources effectively can reduce capital cost.

Financial inclusion has become a major concern among policymakers, researchers, and other financial sector stakeholders. Financial inclusion refers toaccess for individuals and companies low cost financial products and services that meet their different financial

needs.Plurality advantages of financial inclusion, shows a large financial services difference (especially as regards between the quality and accessibility) at an affordable cost exists in developing countries.Few studies have examined the relationship between financial inclusion and economic growth in developing countries; Where financial services facilitate daily life and help families and businesses to plan long-term goals. If individuals own accounts, they are more likely to use other financial services, such as credit, business expansion, investment in securities, life insurance, and other services that improve their lives.(Lucas, 1988)found that the correlation between growth and finance is not clear in all studies, and researchers tended to exaggerate the role of the financial sector.Noted, that in recent years there was a continuous increase in interest for financial inclusion, according to (Sahay et al., 2015). Many countries add financial inclusion as a priority for their agenda of economic and financial reforms. Until now, over than 60 world countries establish financial inclusion as the main objective.(Schumpeter, 1912)revealed that banks have an effective role in backing the economic growth of countries. Goldsmith (1969), Lexis (1913), McKinnon (2010) and Shaw (1973) suggested that the movement of capital from the banking sector to the rest of the economic sectors and individuals through its widespread network would promote innovation, microfinance, and entrepreneurship. This evidence shows the major role that the banking system plays in stimulating economic growth; And the crucial relationship between finance and economic growth.However, similar results are not necessary for all scenarios, and the relationship between finance and economic growth will be unidirectional (Robbinson, 1952).

It seems that financial inclusion has been greatly expanded due to the volume of studies published on its topic, but we believe that it is a fertile subject that still needs studies that address various aspects of it, and in some countries in which the topic has not been written about us cover. Here the importance of our research emerges at the same time what distinguishes it from the rest of the studies. We discussed the relationship of financial inclusion to economic growth (in which there are many studies), the case of Algeria (studies are rare and almost non-existent).

Despite many studies outline the issue of financial inclusion and its relationship with economic growth, the link between those did not receive much attention in the case of Algeria. Moreover, only a few studies have taken into account the role of human resource development. Thus, we conducted this study to try to fill in this gap in the literature. The originality of this paper can be summarized in two lines. First, from the best of our information, this is the first attempt to analyze the link between financial inclusion and economic growth while controlling for trade and human development in the case of Algeria. Second, this paper uses an ARDL approach to explore this relationship.

Regarding the paper's organization, after presenting the brief introduction we present a review of the literature on the relationship between the study variables. Furthermore, we proceed to explain the methodology and variables used to conduct empirical research. The results section identifies the most important findings while the paper ends with the concluding remarks section.

2. Literature review

When we speak about financial inclusion and its impact on economic growth, we find a lot of contributions that cover various aspects and a subsidiary relationship to this relationship. It should also be noted that approximately 2/5 of the world's population is unbanked. At the same time, it was found that the external spread of bank branches boosts the financial inclusion of low-income families, especially if this expansion includes rural areas. Financial inclusion enables low-income banking families to accumulate durable assets (such as cars) more compared to non-bank households. The bank has better access to leverage and has less chance of facing financial pressures (Célerier and Matray, 2019). Financial inclusion extends the access to formal financial institutions services, which improve the financial sector; and that often conducted to thrive economically and reduce poverty (Hannig and Jansen, 2010). An advanced engagement with local financial institutions raises household financial inclusion and brings long-run ameliorations in consumer credit results. Formative engagement to domestic banking improves consumer credit behavior, of course, that needs an acceptable amount of financial knowledge and financial trust (Brown et al., 2019). The impact of financial inclusion policies may extend to move outside the same country. For example, the promotion of financial services granted by banks and financial institutions of the USA and Honduras to Honduran immigrants allowed them to increase their remittances, which leads to expanding the impact of financial inclusion (Endo et al., 2009).

Financial inclusion policy tools should target more binding constraints (breadth, depth, and efficiency). Which are likely to vary from country to country, the relaxation of the three restrictions would increase in (GDP end TFP). The economic impact of financial inclusion policies is not only related to the restrictions that have been reduced, but rather to other restrictions that have been tightened (Dabla-Norris et al., 2020). There are other supportive relationships to the relationship between financial inclusion and growth. Further, there is a relationship between trade openness and economic growth. Once in a while, welfare gains Related to trade liberalization are less than 1% than those in ideal credit markets. Diminution of fees on importations increases your value as being an exporter than a non-exporter. Because that diminution of fees decreases the competitiveness of local companies in the local market (Brooks and Dovis, 2019).

Furthermore, When we talk about the nature of the relationship, human development - economic growth; It is often found that internal accumulation of human capital and technological change support economic growth (Yang and Borland, 1991, p. 461). Perhaps human development is interpreted at the end as an economic variable through the total productivity of the worker from two internal components, namely, the accumulation of knowledge and the use of technology, which drives macroeconomic fluctuations. We refer that positive external factors resulting from the accumulation of knowledge create an economic channel between macroeconomic crises and continuous flows in the long-run economic growth. In turn, the use of domestic technology provides a robust cycle deployment mechanism (Bianchi et al., 2019, p. 15). Otherwise, most of the profits of private companies reflect the return of human capital to the owner. In general, high-income people are often human capital, and the majority of higher-income accumulate on human capital from wage earners and entrepreneurs, not financial capital (Smith et al., 2019).

In a final stage, the accumulation of knowledge becomes the sole engine of growth. Economic growth is no longer based on the growth of material inputs only, but also on the technological change that can offset the depletion of natural resources (Peretto, 2020). Concerning the relationship of financial inclusion - economic growth, it is preferable to follow some other explanatory sub-variables that further explain that relationship; Began with, automation that raises education and growth while increasing inequality and reducing the share of work (Prettner and Strulik, 2019). Industrialization hurts the formation of human capital. emerging countries canprofit from reallocating human capital formation and skills more than developing a dense industrial sector with unskilled labor (Franck and Galor, 2019).

Besides, increased accumulation of capital contributes to society's transition, from one development stage to another. The transition of societies from agricultural to industrial and then to post-industrial has accompanied an increase of capital accumulation; where the need for capital tends to increase income to decrease while saving capacity increases. They must either make substantial external investments or find another use of their savings. Otherwise, widespread unemployment will follow (Clark, 1949). Implementing some financial inclusion measures requires precision in dealing because their impact may be reversed. financial regulations have a positive impact on risk management (Chen et al., 2019). However, in some, it may have a negative effect when it is issued in excessive and unjustified ways (the case of Algeria) according to our opinion and what we will explain in the following from this research. Besides, financial frictions and additional financial costs may discourage investment in productive institutions.(Bento and Restuccia, 2020, p. 04).Where real growth of economic activity was accompanied by growth for the financial

sector especially the period (1970-2000). As it expanded the implementation of financial inclusion measures from the depositors' base, which provided the banks with significant financial resources that led to the expansion of the scope of loans. Hence, the expansion of financial inclusion measures has contributed to accelerating economic growth in India (Mohan, 2006, p. 3). By extension and another comparison, it included several financial variables (deposits, insurance, securities, etc.) for Japan, the US, and Germany, which showed that there was a difference in the financial behavior of their citizens. Japanese were more inclined to safety and security, which made their financial, returns the lowest, compared to Americans and Germans. So Japan makes partial changes to its education system, by integrating financial education on it, targeting children, the elderly, householders, and (SMEs), trying to increase their contribution to the financial system (Yoshino, 2014). That leads us to ask about financial behavior and what defines it in Algeria.

3. Financial Inclusion in Algeria

Article 119 b is issued in 2003 is the first article to ease financial exclusion in the Algerian banking system and the first step it takes in promoting financial inclusion locally, despite its strictness in dealing with bank accounts and determining their powers, but unfortunately, no other details emerged until the year 2012, where it came in Instruction No. (03-2012), which is the second step, where it began to consolidate financial inclusion somewhat, after it enters into force as of January 02, 2013. Where it carried some details explaining the mechanism of applying the previous article (Art. 119 bis); and carried The instruction is nine articles that explain and clarify the right to own a bank account (from someone who does not own it); Bank of Algeria set conditions of open and close accounts as well. Therefore, the Bank of Algeria Governor stressed the need to attract non-banking groups or those that did not have an opportunity to obtain banking services. as well as the need to provide them with high-quality financial services at a reasonable cost by encouraging the provision of financing, especially to small and micro enterprises, and improving the protection of beneficiaries of financial services By increasing their knowledge of their rights. Finally, he asserted that the Bank of Algeria would continue its efforts to promote financial inclusion at the regional level.

The third step that Algeria has taken in the course of promoting financial inclusion is represented by its central bank; it was within the framework of regional efforts through the Board of Governors of central banks and Arab monetary institutions, where the importance of financial inclusion in realizing inclusive and sustainable economic growth should continuing efforts to ensure access to financial services lower cost. The Council believes that the process of enhancing financial inclusion needs to enhance cooperation,

coordination, and exchange of experiences and expertise at the regional and international levels, especially in selecting policies and programs to support financial inclusion.

The Council also believes that the development of legislation, regulations and regulatory frameworks on the one hand, and the development of sound infrastructure for the financial and banking system, on the other hand, helps to improve the spread of banking services; this is of course with special attention given to issues of protecting the consumer of financial services.

It may seem to many scholars that studying the relationship between financial inclusion and economic growth is trivial. However, when we talk about the case of Algeria, we find the study very important and perhaps its importance is based on the fact that this case is considered the most complex case studied (its financial system is marred by many ambiguities, as well as its relationship to the economy as a whole). Even though the studies that dealt with the problem in the case of Algeria are almost non-existent or exceed the number of fingers of one hand. Algeria is considered one of the countries that are more closed financially and less open to trade. Nevertheless, we expect, by studying the relationship between financial inclusion and economic growth in Algeria, that results will emerge, to say the least, that they differ, even partially, from previous studies that included another country or countries.

4. Data and Methodology

4.1. Data

This paper is based on annual time series data, on Economic Growth, Financial Inclusion (FI), Trade Openness (TO), and Human Development (HD), fromthe World Bank database. This paper covers the period from 1980 to 2017.We also used the secondary school enrollment rate as a proxy to (HD), following the example of many studies (Sulaiman et al., 2015; Taşel and Bayarçelik, 2013). Besides, for Economic Growth we chose GDP per capita as a proxy variable (Kim et al., 2018; Sethi and Acharya, 2018); but we transformed it into logarithms. Also, we defined (TO), as the ratio of the sum of the exports and imports/GDP; we transformed it into logarithms as well (Kim et al., 2018; Sethi and Acharya, 2018). (FI) is a set of strategies for combating banking and financial exclusion. It provides a bunch of financial services, which are low-priced to the vulnerableand excluded parts of the population. Remark to, that we chose M3/GDP ratio evenlyis a proxy of (FI);that includes money kept outside the banking system, demand, banks, and non-bank interest-bearing liabilities (Hajilee et al., 2017; Hajilee and Niroomand, 2019). We analyzed the relationship between financial inclusion, trade openness, and economic growth in Algeria using ARDL. Based on World Bank data. Data covers 1980-2018. We took Natural logs of the variables for the estimation.

4.2. Methodology

Econometrics offers many proposals to probe the long-run equilibrium (cointegration) amongst time series variables (such as, Engle and Granger, 1987; Johansen, 1988; Phillips and Hansen, 1990). In this paper, we chose the autoregressive distributed lag (ARDL) modeling approach to examine the relationship between variables. We employed the ARDL approach of cointegration (Pesaran et al., 2001; Pesaran and Pesaran, 1997; Pesaran and Shin, 1999). ARDL cointegration approach has many additional advantages when compared to other cointegration approaches. The most important feature that can be identified is its ability to bypass the need for pre-test stationarity, so the order of cointegration is less important for variables. As shown, the appeal of this method is its power to fit in with series in the case of I(0) or I(1), anyway, the regressive variables in the model are cointegrated mutually, I (1) or even I (0).Thus, without taking into account the issue of model endogeneity; the ARDL approach usually gives an unbiased estimate of the long-run relationship between variables (Adom, 2011). Following the literature review, our model may be expressed as:

$$GDP_t = F(FI_t, HD_t, TO_t, \varepsilon_t) \tag{1}$$

At period t, GDP is gross domestic product per capita, FI is financial inclusion proxied by liquid liabilities to GDP, HDis school primary enrollment, TO is Trade openness which is a measure of the total trade/GDP, and ε is an error term. To obtain consistent and reliable empirical estimates we have converted all the variables into logarithms. As the following logarithmic model:

$$\ln GDP_t = \beta_0 + \beta_1 \ln FI_t + \beta_2 \ln HD_t + \beta_3 \ln TO_t + \varepsilon_t \tag{2}$$

To explore the relationship between study variables, (Pesaran et al., 2001) suggested Wald or F-statistic for bounds test. The asymptotic distribution of the F statistic is non-standard under the null hypothesis of no cointegration relationship between the examined variables, irrespective of whether the explanatory variables are purely I(0) or I(1). The cointegration relationship for the economic growth equation is estimated using the bounds test, which is based on the following Unrestricted Error Correction Model (UECM):

$$\begin{aligned}\Delta \ln GDP_t = {} & bo + \textstyle\sum_{t-1}^{n} b_1 \Delta \ln GDP_{t-1} + \sum_{t=0}^{n} b_2 \Delta \ln FI_{t-1} + \sum_{t=0}^{n} b_3 \Delta \ln HD_{t-1} \\ & + \textstyle\sum_{t-1}^{n} b_4 \Delta \ln TO_{t-1} + b_5 \ln GDP_{t-1} + b_6 \ln FI_{t-1} \\ & + b_7 \ln HD_{t-1} + b_8 TO_{t-1} + + \varepsilon_t \end{aligned} \tag{3}$$

Where b_0 is the drift constituent and b_1, b_2, b_3, b_4 are errors correction dynamics. b_5, b_6, b_7, b_8 Represent the long-run relationship in equation (2). Δ is the first difference operator and ε is the white noise term. And ΔlnGDP, ΔlnFI, ΔlnTO, and ΔlnHD are the

first difference of the logarithms of the gross domestic product per capita, financial inclusion, trade openness, and secondary primary enrolment respectively. An appropriate lag selection was based on the Akaike Information Criterion (AIC).After regression of Equation (2), the Wald test (F-statistic) was used to identify the existence of the long-run relationship betweenthe different variables. The null hypothesis is tested by considering the UECM for economic growth equation in (2) excluding the lagged variables GDP, FI, TO and HD; more formally, we perform a joint significance test, where the null and alternative hypotheses are:

$$H_O : b_5 = b_6 = b_7 = b_8 = 0 \quad \text{(no cointegration among the variables)}$$
$$H_A : b_5 \neq b_6 \neq b_7 \neq b_8 \neq 0] \quad \text{(cointegration amongst the variables).}$$

When using the joint F-statistic or Wald statistic for bounds test; we test the hypothesis of no cointegration (H0) against the Substitute hypothesis cointegration (H1). Under the null, we tested the Joint significance of coefficients for lagged variables using F statistics calculated. Regressors are purely I(0), and purely I(1), respectively; in the assumption of lower and upper bounds critical values; with known that those two critical values are components of Bound F-test.In cases where the F-statistical value is greater than I(1) the null hypothesis (*H*0) of no cointegration among the variables is rejected. If the computed F-statistic lies below the lower critical values, the null hypothesis of no cointegration is not rejected. The test is inconclusive if the computed F-statistic lies in between I(1) and I(0). Once the long-run association has been determined, the error correction model (ECM) can be estimated according to the following equation:

$$\Delta \ln GDP_t = bo + \sum_{t-1}^{n} b_1 \Delta \ln GDP_{t-1} + \sum_{t=0}^{n} b_2 \Delta \ln FI_{t-1} + \sum_{t=0}^{n} b_3 \Delta \ln HD_{t-1} + \sum_{t-1}^{n} b_4 \Delta \ln TO_{t-1} + \Phi ECT_{t-1} + \varepsilon_t (3) \qquad (4)$$

Where the speed of the change is indicated in ECT_{t-1}.Once it has a negative statistically significant coefficient, it is appropriate.To assess the fit of the ARDL model, diagnostic and stability tests are performed.The diagnostic test looks at the model's related serial correlation, functional form, normality, and heteroscedasticity. The stability test of the regression parameter coefficients is carried out using the stabilization testing method Brown et al. (1975), also known as the Cumulative Sum of Recursive Residual Squares (CUSUMSQ).

4.3. Granger causality tests

Based on the (VECM) model, we tested granger causality between variables: (GDP), (FI), and (TO) (Engle and Granger, 1987). The following matrix shows the framework of vector error correction:

$$\begin{pmatrix} \ln EG_t \\ \ln FI_t \\ \ln HD_t \\ \ln TO_t \end{pmatrix} = \begin{pmatrix} b_5 \\ b_6 \\ b_7 \\ b_8 \end{pmatrix} + \begin{pmatrix} \Phi_{1,1} & \Phi_{1,2} & \Phi_{1,3} & \Phi_{1,4} \\ \Phi_{2,1} & \Phi_{2,2} & \Phi_{2,3} & \Phi_{2,4} \\ \Phi_{3,1} & \Phi_{3,2} & \Phi_{3,3} & \Phi_{3,4} \\ \Phi_{4,1} & \Phi_{4,2} & \Phi_{4,3} & \Phi_{4,4} \end{pmatrix} \begin{pmatrix} \ln EG_{t-1} \\ \ln FI_{t-1} \\ \ln HD_{t-1} \\ \ln TO_{t-1} \end{pmatrix} + \begin{pmatrix} \psi_{1,1} & \psi_{1,2} & \psi_{1,3} & \psi_{1,4} \\ \psi_{2,1} & \psi_{2,2} & \psi_{2,3} & \psi_{2,4} \\ \psi_{3,1} & \psi_{3,2} & \psi_{3,3} & \psi_{3,4} \\ \psi_{4,1} & \psi_{4,2} & \psi_{4,3} & \psi_{4,4} \end{pmatrix} \begin{pmatrix} \ln EG_{t-1} \\ \ln FI_{t-1} \\ \ln HD_{t-1} \\ \ln TO_{t-1} \end{pmatrix} + \begin{pmatrix} \nu_1 \\ \nu_2 \\ \nu_3 \\ \nu_4 \end{pmatrix} [ECT_{t-1}] + \begin{pmatrix} \theta_{1t} \\ \theta_{2t} \\ \theta_{3t} \\ \theta_{4t} \end{pmatrix} \quad (5)$$

Where ψs indicates the parameters to be estimated and ECT_{t-1} is the lagged error term which indicates the condition of long-run cointegration. θs are residual terms. The causal relationship between study variables was tested by using the Engle and Granger model, which is done in two steps; for that, we started by creating a Vector Error Correction model and used it to analyze the relationships between the study variables; as follows:

$$\Delta \text{GDP} = \lambda_0 + \sum_{i=1}^{m} \alpha_i \Delta \text{GDP}_{t-i} + \sum_{i=1}^{n} \vartheta_i \Delta \text{FI}_{t-i} + \sum_{i=1}^{k} \delta_i \Delta HD_{t-i} + \sum_{i=1}^{k} \beta_i \Delta TO_{t-i} + \zeta_2 ECM_{t-1} + \varepsilon_{1t} \quad (6)$$

$$\Delta \text{FI} = B_0 + \sum_{i=1}^{m} \theta_i \Delta FI_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta \text{GDP}_{t-i} + \sum_{i=1}^{k} \lambda_i \Delta \text{HD}_{t-i} + \sum_{i=1}^{k} \rho_i \Delta TO_{t-i} + \zeta_1 ECM + \varepsilon_{2t} \quad (7)$$

$$\Delta \text{HD} = \nu_0 + \sum_{i=1}^{m} \mu_i \Delta \text{HD}_{t-i} + \sum_{i=1}^{n} \upsilon_i \Delta \text{GDP}_{t-i} + \sum_{i=1}^{k} \kappa_i \Delta \text{FI}_{t-i} + \sum_{i=1}^{k} \lambda K_i \Delta TO_{t-i} + \zeta_3 ECM + \varepsilon_{3t} \quad (8)$$

$$\Delta \text{TO} = \iota o_0 + \sum_{i=1}^{m} \psi_i \Delta \text{TO}_{t-i} + \sum_{i=1}^{n} \varkappa_i \Delta \text{GDP}_{t-i} + \sum_{i=1}^{k} \varpi_i \Delta \text{FI}_{t-i} + \sum_{i=1}^{k} u_i \Delta HD_{t-i} + \zeta_3 ECM + \varepsilon_{3t} \quad (9)$$

Normally e_t are the residues distributed with zero mean and constant variance and we used the symbol ECM_{t-1} to indicate error correction resulting in the calculation of the long-term equilibrium relationship. After a shock, the adjustment speed to the Equilibrium point was indicated by the symbol ς. ARDL cointegration approach checks whether there is a long-term relationship between our variables or not. The direction of causality is not indicated. After analyzing the long-term relationship between financial inclusion and economic growth in Algeria, the Granger causality test is used to assess the direction of causality between the variables. According to Granger (1969), X causes Y by demonstrating how much of the present Y can be explained by past Y values and then seeing if adding lagged X values would boost the explanation. Y is said to be Granger-Caused by X when X helps

to predict Y, or equivalently when the coefficients of the lagged Xs are statistically significant (Isu and Okpara, 2013).

However, Granger (1988) observed that if a set of variables are cointegrated, there must be a causality (short-run or long-run) that cannot be captured by differenced variables. The Granger causality test must be performed within the context of the error correction model ECM to address this constraint. Therefore, this Granger causality test does not apply if there is no cointegration. To examine the causality between our variables, the following model is stated as:

$$\Delta\, yt = \beta 0 + \sum_{k=1}^{m} \beta k \Delta yt - k + \sum_{i=0}^{n} \varpi t\, \Delta xt - i + ECTt - 1 + ut \quad (10)$$

$$\Delta xt = \gamma 0 + \sum_{k=1}^{n} \varphi k\, \Delta xt - l + \sum_{k=0}^{m} \delta k \Delta yt - k + ECTt - 1 + vt \quad (11)$$

Where y_t and x_t are the variables of our model. It can be economic growth with financial inclusion or human development with trade openness. We change the position of the two variables to find the direction of causality. U_t and V_t are mutually uncorrelated error terms that capture all variations in y_t and x_t, not in the lagged values.

5. Empirical Results

5.1. Descriptive statistics

Table 1 provides summary statistics of the variables. The table indicates that the four variables are normally distributed.

Table 1: Descriptive Statistics of the Variables

	lnGDP	lnFI	LnTO	LnHD
Mean	8.273425	4.008996	4.029985	4.090920
Median	8.251601	4.021955	4.059839	4.082626
Max	8.483477	4.408000	4.339719	4.326144
Min	8.065420	3.460246	3.486916	3.847506
Standard Deviation	0.129759	0.255302	0.194165	0.159255
Skewness	0.175206	-0.479263	-0.834009	0.076438
Kurtosis	1.715167	2.361183	3.512760	1.691386
Jarque-Bera	2.882073	2.156144	4.948455	2.820742
Probablilty	0.236682	0.340251	0.084228	0.244053
Observations	39	39	39	39

5.2. Unit Root Tests.

In econometric literature, ADF by Dicky and Fuller (1981), P-P by Phillips and Perron (1988),and KPSS test arethe most commonly used traditional unit root test.The unit root test aims to determine the order of integration. This study uses the (Perron and Vogelsang, 1992), augmented Dickey-Fuller test (ADF), and KPSS tests. Table 2 illustrates the results of these unit root tests.

Table 2: Unit Root Test Results

ADF Test

Variables	t	Pr	Variables	t	Pr
FI (At level)	-1.474674	0.5351	FI (first diff)	-4.227661	0.0020
GDP (At level)	-1.109646	0.7010	GDP (first diff)	-3.241909	0.0253
HD(At level)	-0.154879	0.9355	HD(first diff)	-5.236589	0.0001
TO(At level)	-1.67650	0.4347	TR (first diff)	-4.600384	0.0007

Phillips-Perron Test

Variables	t	Pr	Variables	t	Pr
FI (At level)	-0.892544	0.7798	FI (first diff)	-4.159312	0.0024
GDP (At level)	-0.345533	0.9084	GDP (first diff)	-3.303690	0.0219
HD(At level)	-3.880653	0.0228	-	-	-
TO (At level)	-1.845208	0.3538	TR (first diff)	-4.415092	0.0012

KPSS test

Variables	t	Critical value	Variables	t	Pr
FI (At level)	0.1565	0.14600	FI (first diff)	0.0921515	0.14600
GDP(At level)	0.161625	0.14600	GDP (first diff)	0.103928	0.14600
HD (At level)	0.0946	0.14600	-	-	-
TO (At level)	0.1037	0.14600	-	-	-

Unit root test results differ from one test to another. If we examine the results for all variables in the level and differenced forms, we see that in the KPSS test (level form), the HD and TO variable appears stationary, while the GDP and FI stationaryat the first difference. The results of ADF test showedthat all variables are integrated of the same, after first differencing. Consequently, the results are not consistent across different tests. No variable is integrated of order two, I(2), thus, indicating the suitability of the variables for the ARDL bounds testing approach. Therefore, we use the variables I (0) or I (1) for analysis.The results show that no variable is *I*(2).

5.3. Lag Order selection criteria

The acceptable lag length was selected using the Akaike Information Criterion (AIC). For the ARDL model to measure F-statistics for cointegration, the selection of lag length is vital. The table below shows lag 3 as the best lag to be used.

Table 3: Lag order selection criteria

Lag	LogL	LR	AIC	SC	HQ
0	104.9016	NA	-5.605645	-5.429699	-5.544235
1	283.0690	306.8439	-14.61495	-13.73521*	-14.30790
2	305.5343	33.69793*	-14.97413	-13.39061	-14.42144*
3	323.2558	22.64409	-15.06977*	-12.78246	-14.27144

5.4. Bounds Test for Cointegration

The empirical results from Table 4 indicate that the computed F-statistics exceeded the upper bound of (Pesaran et al., 2001) F-bounds table. Therefore, the null hypothesis indicating the existence of a long-term association is dismissed at a 10% significance level. Having established the order of integration of the variables, the next step in the ARDL approach is to test the long-run nexus between the variables with the help of the bounds test. The result of the ARDL bounds test of cointegrationis reported in Table 4. According to the table, the F-statistics (6.7602) exceeded the upper bound of Pesaran et al. (2001) F-bounds table, we reject the H_0 of no co-integration at 1% significance level as it is greaterthan the critical value of upper bound, I(1) of 4.66 at 1% level of significance. Thus, the cointegration test confirms the long-run association between financial inclusion and economic growth.

Table 4: ARDL Bounds Test for Cointegration

F-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	**Value**	**Signif.**	**Lower Bound**	**Upper Bound**
F-statistic	6.760286***	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Note: *** shows 1% level of significance.

5.5. Long-run ARDL Coefficients

Pesaran and Pesaran (1997) suggest that any result that supports cointegration in at least one lag structure provides evidence for the long-term nexus. The computed F-statistics together with the critical bounds values are presented in Table 5. We estimated the ARDL model to find the long-run coefficients. The coefficient of Financial Inclusion, human development,and trade openness are positive which corresponds to the economic theory, these coefficients are statistically significant (P-values, i.e. 0.0005 and 0.0002 and 0.0003 respectively).The results reveal that economic growth, financial inclusion, human development, and trade openness, have a relationship in the long-run.

Table 5: Coefficients of the long-run, Dependent Variable: D(RGDP)

Variable	**Coefficient**	**Standard Error**	**T**	**Pr**
Financial Inclusion	0.203731***	0.051098	3.987035	0.0005
human development	0.417515***	0.096482	4.327397	0.0002
Trade Openness	0.452015***	0.109434	4.130478	0.0003
Constant	3.990834	0.337628	11.82022	0.0000

Note: *, ** and *** represent 10%, 5% and 1% levels of significance respectively.

The results indicate that in the long-run, a 1% increase in financial inclusion will be accompanied by a 20.3% rise in the economic growth level. After the long-run estimation, we get a short-run estimation using ECM as given the result in Table 6. The error correction term is statistically significant with an expected negative sign. The coefficient of ECT (t-1) is -0.57 (P-value is 0.000). This shows the speed of adjustment towards the long-run equilibrium is high. The diversion from the short-run in GDP is corrected by 57.8% within a year.

Table 6: Estimated Short-Run coefficients using ECM

Variable	Coefficient	Standard Error	t	Pr
D(GDP(-1))	0.493956	0.123839	3.988705	0.0011
D(GDP(-2))	0.522207	0.114235	4.571345	0.0003
D(GDP(-3))	0.257883	0.124174	2.076786	0.0543
D(FI)	0.031525	0.022935	1.374532	0.1882
D(FI(-1))	0.030302	0.030664	0.988205	0.3378
D(FI(-2))	0.101008	0.028848	3.501347	0.0030
D(HD)	0.234159	0.202993	1.153530	0.2656
D(HD(-1))	-0.720617	0.204891	-3.517074	0.0029
D(HD(-2))	0.627974	0.152904	4.106974	0.0008
D(HD(-3))	0.378618	0.160957	2.352285	0.0318
D(TO)	-0.016701	0.025858	-0.645875	0.5275
D(TO(-1))	0.061707	0.038814	1.589803	0.1314
D(TO(-2))	-0.197393	0.040916	-4.824352	0.0002
CointEq(-1)*	-0.578429	0.088987	-6.500137	0.0000

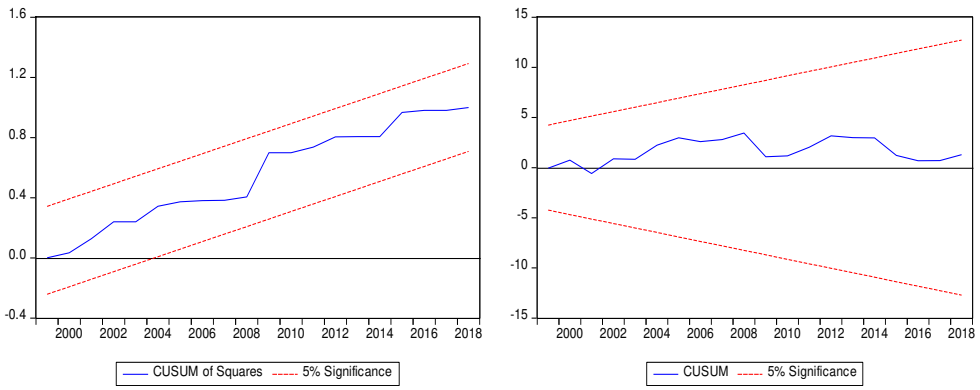
The results show that the GDP per capita lagged by two periods has a positive significant impact on economic growth. The results also show that the trade opennesslagged by two to three periods has a positive significant impact on economic growth. We run some diagnostic tests such as serial correlation test, heteroscedasticity, normality tests, and model specification test (linear) to check the suitability and validity of the above-mentioned findings, i.e.Ramsey'sRESETtest. The diagnostics suggest that there is no problem in the model of serial correlation and heteroskedasticity, and residuals are normally distributed. The results are reported in Table 7.

Table 7: Diagnostic Tests Results

Variable	Statistic	Prob.
Breusch-Godfrey Serial-correlation LM Test	1.44158***	0.2696
Heteroskedasticity:Breusch-Pagan-Godfrey	1.39507***	0.2553
Normality Test: JarqueBera	1.25007***	0.5352
Ramsey Regression Equation Specification Error (Ramsey RESET) Test	0.002149***	0.9636

To confirm that the model met the stability test, the cumulative sum of recursive residuals (CUSUM) and CUSUM of squares (CUSUMSQ) test proposed by (R. L. Brown et al., 1975)is used. Plotsof both CUSUM and CUSUMSQ test statistics that fall inside the critical bounds of 5% significance. This means that the estimated parameters are stable over the study period.

Figure 13: CUSUM



The stability of the parameters is investigated using the Cumulative sum of recursive residuals (CUSUM) and the cumulative sum squared of the recursive residuals (CUSUMsq). The last step in ARDL is to check the stability of the long and short-term parameters of equation (2). The techniques of CUSUM based on the cumulative sum of the recursive residues and CUSUMQ based on the cumulative sum squared of the recursive residuals are applied (Figure 13). These tests are critical because if a model is incorrectly defined, estimated coefficients can differ over time series dates.Therefore, it's likely to have biasedestimates that can impair the empirical findings. The results show that the graph of CUSUM and CUSUMQ statistics remains within the range of critical values at the 5% threshold, which implies that the coefficients of the model are stable.

5.6. Results for Granger Causality Test

The ARDL methods do not indicate the direction of causality between the variables, but since there is a long-run relationship among economic growth, financial inclusion, and trade openness, a causality relationship must exist in at least one direction. The results in Table 8 show that Granger causalities results.

Financial inclusion can promote both economic and financial development. In this sense, it can reinforce the effects of the latter on the rate of growth. A large literature highlights the fact that developing economies suffer from a shortage of capital and insufficient domestic

savings (Gul et al., 2018; Sethi and Acharya, 2018). The capital inflows following the financial opening will thus favor the rate of capital accumulation, and thereby growth. The ganger causality test shows also that trade openness is an essential element of growth and job creation. Trade provides new market opportunities for domestic firms, stronger productivity, and innovation through competition.We find also that human development cause trade openness and economic growth in Algeria. Our results demonstrate that higher levels of human capital stimulate economic growth and improve trade openness.Which in line with many studies that they have pointed out that human capital has an impact on firm competitiveness which leads to economic performance (Bayarçelik and Taşel, 2012; Sulaiman et al., 2015).

Table 8: Granger Causality

Granger Causality Results			
Null Hypothesis:	Obser	F	Pr.
FI does not Granger Cause GDP	37	2.83276	0.0737
GDP does not Granger Cause FI		3.17638	0.0552
TO does not Granger Cause GDP	37	3.26076	0.0514
GDP does not Granger Cause TO		0.22153	0.8025
HD does not Granger Cause GDP	37	3.08401	0.0596
GDP does not Granger Cause HD		0.16533	0.8483
TO does not Granger Cause FI	37	1.88221	0.1687
FI does not Granger Cause TO		1.04203	0.3644
HD does not Granger Cause FI	37	0.63491	0.5365
FI does not Granger Cause HD		0.21344	0.8089
HD does not Granger Cause TO	37	3.69484	0.0360
TO does not Granger Cause HD		0.24470	0.7844

The literature has shown thattrade openness promotes economic development, by providing goods and services, allocating resources, and disseminating technology (Barro and Sala-i-Martin, 1997; Rivera-Batiz and Romer, 1991). As a result, countries with greater trade openness are projected to experience higher economic growth than countries with lower trade openness. From this perspective, developing countries have a lot to gain through trade with developed countries. International institutions recommend the application of trade liberalization policies for developing countries with a view to opening and integrating them in the global market.

6. Conclusion

To sum up, this paper provides evidence that financial inclusion promotes economic development in Algeria. The results suggest the positive impact of financial inclusion,

human development, and trade openness on growth. Findings revealed that there is a one direction causality from trade openness to growth and from human development to economic growth. Also, human development granger cause trade openness in Algeria. Therefore, we recommend that Proactive measures need to be established to sustain economic growth in Algeria through enhancing financial inclusion, facilitate the opening of bank accounts, enhancing information and communications technology in the financial and banking sector, reducing the Internet prices to boost the use of online banking services and increasing the number of ATMs.The promotion of an inclusive financial system is seen as a political priority in many developing countries; particularly in Algeria which has set up an agency specializing in the deployment of microfinance, although the importance of financial inclusion is widely recognized, its measurement remains ambiguous because of insufficient research and data, as well as the methods used to achieve reliable results based on microdata. Even if the empirical results showed that there is a positive relationship between the study variables, especially financial inclusion and economic growth. The interpretation of this result is the need for the monetary and financial authorities in Algeria to make greater efforts in terms of enhancing financial inclusion by integrating financial technology into its financial system and facilitating the access of various groups of society, especially the vulnerable (women and residents of rural areas) to various financial services through the expansion of its banking network (opening branches of banks in rural and remote areas) on a wide range of the geographical area of Algeria.

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