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# Openness, financial development and economic growth in Algeria: An ARDL bound testing approach

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## To cite this article:

Miloud Lacheheb, Peter Adamu, Seth Akutson. Openness, Financial Development and Economic Growth in Algeria: An ARDL Bound Testing Approach. *International Journal of Economics, Finance and Management Sciences*. Vol. 1, No. 6, 2013, pp. 400-405.

doi: 10.11648/j.ijefm.20130106.28

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**Abstract:** This study examines the relationship between openness, financial development, and economic growth in Algeria using the autoregressive distributed lag (ARDL) cointegration framework. The results based on the bounds testing procedure confirm that a long-run relationship between openness, financial development, and economic growth exist. Data were obtained from the World Bank Development Indicators for the period of 1980 to 2010. Importantly, our results reveal that, openness has a significantly positive effect on economic growth. Broad money which is a proxy for financial development in this study is positive but insignificantly related to economic growth. Also, both labor force and gross capital formation are insignificant. These findings suggest a dire need for financial reforms in Algeria in order to improve efficiency in the financial sector so as to stimulate saving/investment and thus, long-term economic growth.

**Keywords:** Openness, Financial Development, Economic Growth, Algeria, ARDL

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## 1. Introduction

Financial markets and institutions perform an important function in the economic development process, particularly through their role in allocating finance to various productive activities. These activities include mobilizing savings, obtaining information about investments and allocating resources, facilitating risk enhancement, and monitoring managers and exerting corporate control. The performance of the financial markets and institutions has been examined using various empirical methods. By and large, empirical studies advocate that a well-functioning financial market encourage long-run economic growth [12, 16, 3, 23, 4, 6, and 14]. Also, [9] provides an overview of a large frame of empirical literature which suggests that financial development can define differences in economic growth through countries. Indeed, many empirical and theoretical studies have examined the relationship between trade openness and economic growth. [9], states that there is no straightforward relationship between trade liberalization and economic growth. Whereas, [19] confirm that in long-run, trade openness advances economic growth.

This paper attempts to investigate the relationship

between openness, financial development and economic growth of Algeria. Firstly, the Algerian economy heavily depends on the oil and gas sector for her revenue. However, the financial sector has been bedeviled by incessant instability. The instability was the main characteristic of financial sector since 1980's due to, perhaps, the various financial policies applied. The domestic financial institutions in the country normally receive subsidies from the government to achieve higher competitiveness against foreign institutions. Moreover, from 1980 to 1988 broad money has increased, after that a dramatic decline occurred until the year of 1996. Broad money recovered its steady growth from 1996 to the year 2010. Exports of oil and gas – which denote between 94% and 98% of total exports in Algeria, have increased dramatically, except the period of 1985 to 1994. This is because these products are surely needed in developed countries, and also, being exported in raw form [29]. On the other hand, imports continue to rise except the period 1990 to 1997 and this might be due to the fragility features of industrial organizations to achieve self-sufficiency because of poor technology and unskilled manpower. Again, as a result of big portion of hydrocarbons sector in GDP, exports maintained greater than imports. Hence, balance of payments of goods and

services sustained positive regardless volume of goods and services being imported (World Development Indicators, 2010).

The contribution of exports in GDP has increased from 12% in 1986 to 48.6% in 2006. This increase might be from the huge contributions of the hydrocarbons sector in Algeria with a blend of the increase in prices of oil and gas (Figure 1). [1] Investigated the effects of globalization of financial services on banking industry and stock market in Algeria. Some other studies emphasized the relationship between financial development and economic growth in MENA (Middle East and North Africa) countries [12]. Also, [27] examined the causal relationship between openness and economic growth in MENA countries.

It is obvious that only a few studies related to financial development, openness and economic growth exist for Algeria in particular. This study will go a long way to contribute to the bulk of literatures on financial development as it relates economic growth from the perspective of the Algerian economy. This hypothesis has been established separately and focused on the correlation between economic growth and one or two of these indicators for the case of Algeria. Therefore, placing more emphasis on this topic is helpful to understand the relationship between financial development, openness and economic growth.

The paper is organized as follows: Section 2 describes various literatures reviewed. Section 3 explains the used data, methodology and econometrics model. Section 4 reports empirical results. Finally, section 5 concludes the paper.

## 2. Literature Review

From an empirical front, a growing contemporary empirical body of literature shows how financial intermediation mobilizes savings, allocates resources, diversifies risks, and contributes to economic growth [7 and 11]. The new growth theory argues that financial intermediaries and markets appear endogenously in response to market incompleteness and, hence, contribute to long-term growth. Financial institutions and markets, which arise endogenously to mitigate the effects of information and transaction cost frictions, influences decisions to invest in productivity-enhancing activities through evaluating prospective entrepreneurs and funding the most promising ones. The underlying assumption is that financial intermediaries can provide these evaluation and monitoring services more efficiently than individuals. [17 and 16] surveyed a large amount of empirical research that deals with the relationship between the financial sector and long-run growth. [17] Argued that financial systems can accomplish five functions to ameliorate information and transactions frictions and contribute to long-run growth. These functions are: facilitating risk amelioration, acquiring information about investments and allocating resources, monitoring managers and exerting corporate

control, mobilizing savings, and facilitating exchange. These functions facilitate investment and, hence, higher economic growth.

The relationship between trade openness and growth is a highly debated topic in the growth and development literature. Yet, this issue is far from being resolved. Theoretical growth studies suggest at best a very complex and ambiguous relationship between trade restrictions and growth. The endogenous growth literature has been diverse enough to provide a different array of models in which trade restrictions can decrease or increase the worldwide rate of growth [26, 8, 24 and 18]. [10] Stated that the concept of openness applied to trade policy could be synonymous with the idea of neutrality. Neutrality means that incentives are neutral between saving a unit of foreign exchange through import substitution and earning a unit of foreign exchange through exports.

## 3. Data and Methodology

This study used annual data from 1980 to 2010. As a measure of financial development, broad money represents the ratio of money stock, i.e., M2 to nominal GDP. It is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper. This variable has been used as a standard measure of financial development in numerous studies [3 and 13]. In developing countries, a large part of M2 stock consists of currency held outside banks. As such, an increase in the M2/GDP ratio may reflect an extensive use of currency rather than an increase in bank deposits, and for this reason this measure is less indicative of the degree of financial intermediation by banking institutions. An increase in M2 may also indicate a capital flight out of a country, therefore negatively affecting economic growth.

On the other hand, openness denotes: exports plus Imports divided by GDP is the total trade as a percentage of GDP. The export and import figures are in national currencies. A number of literature use exports plus imports divided by RGDP to measure trade openness (see [27, among others). The third measure is gross capital formation (GCF). Finally, labor force represents the sum of total labor force in Algeria for the age 15-65, which is widely applied in empirical studies as a proxy of labor force.

Adopting the popular Cobb Douglass production function as applied in the popular economic model, the function is specified as:

$$Y = AK^\alpha L^\beta \quad (1)$$

Where: Y is Real GDP per capita, A is Total factor productivity, L is labor force and K is capital stock. Assuming Total factor productivity (A) is directly affected by Trade Openness and Broad Money and other variables being exogenous.

$$A=f(T_o, B_m) \tag{2} \qquad Y= T_o B_m K^\alpha L^\beta \tag{3}$$

Equating equation (1) and (2) produces:

$$\ln(RGDPC) = \beta_0 + \beta_1 \ln(gcf) + \beta_2 \ln(lbr) + \beta_3 \ln(open) + \beta_4 \ln(Bm) + \tag{4}$$

Although, numerous studies have been conducted in evaluating the effect of openness on economic growth, but this issue is still debatable.[8] Stated that openness to trade is seen as having a positive impact on economic growth primarily by facilitating technology spillovers, which, in turn, would increase productivity, international competitiveness, and export revenues.[12] Argued that a well-functioning financial system is necessary to reach

Following previous empirical studies and expressing equation (3) in logarithm form, the model is presented as:

steady economic growth in developing countries. Thus, the above model attempts to estimate the effect of openness and financial development on economic growth. The ARDL procedure can distinguish between dependent and explanatory variables. In this case, the error correction representations of the ARDL specification model for Eq. (4) are given by:

$$\Delta RGDP C_t = \beta_0 + \sum \beta_1 \Delta RGDP C_{t-1} + \sum \beta_2 \Delta inv_{t-1} + \sum \beta_3 \Delta lbr_{t-1} + \sum \beta_4 \Delta open_{t-1} + \sum \beta_5 \Delta FD_{t-1} + \delta_1 RGDP C_{t-1} + \delta_2 inv_{t-1} + \delta_3 lbr_{t-1} + \delta_4 open_{t-1} + \delta_5 FD_{t-1} + \epsilon_t \tag{5}$$

Where  $\Delta$  represents the first difference operator,  $\beta_0$  is the drift component,  $\epsilon_t$  is the usual white noise residuals, Eq. (2) is a standard VAR model in which a linear combination of lagged-level variables are added as proxy for lagged error terms which measures the departure of the dependent variable from the independent variables in Eq. (4).

empirical model to gauge the adequacy of the specification of the model (Table 3). The computed Lagrange multiplier (LM) test for AR [1] = 0.52723 [0.468] is statistically insignificant at 10% significance level, which suggests that the disturbances are serially uncorrelated.

#### 4. Empirical Results

The empirical results commences by testing the order of integration of the variables. The Augmented Dickey Fuller approach was employed.

Table 1 obviously reveals that the variables are a combination of I(0) and I(1) variables. Thus, the Autoregressive Distributed Lag approach (ARDL) popularized by [22] is most suitable for this study. However, before the long-run and short-run estimations are conducted, a bound test is necessary to ascertain the existence of a cointegration between the variables.

For the fact that openness is significant at 5% level, while broad money appears to be insignificant apparently matches the Algerian economy. Real GDP per capita seriously depends on exports, specifically, oil and gas. On the other hand, financial development contributes less to economic growth and this no doubt captures the insignificant relationship it has with growth in this study. This reveals the fragile nature of the financial sector in Algeria.

Table 2 represents the computed F-value, likelihood ratio and Lagrange multiplier for testing the existence of long-run relationship between openness, financial development and economic growth. The calculated F-statistics is compared with the critical bounds provided by [21]. The calculated F-statistic  $F(5, 9) = 6.1237$  is greater than the upper bound of the critical value obtained from [21], suggesting there is compelling evidence for cointegration between economic growth and its determinants.

We proceed to estimate a dynamic (short-run) model. Table 4 presents the error correction estimations the model. The empirical results are based on the re-parameterization of the estimated ARDL (1,0, 1, 0, 0) model. Based on the results, the lagged error-correction term carries its expected negative sign and it is significant at 1% level. [14] Showed that a significant error-correction term is a relatively more efficient way to establish cointegration. The coefficient - .28321 reveals that approximately 28% of the previous year's discrepancy between the actual and value of real GDP per capita is corrected each year.

The findings in Table 3 reflect the importance of openness and broad money towards real GDP per capita. Long run results show that change by 1% in openness leads to 1.05% increase in economic growth. While increase by 1% in broad money leads to increase by 0.12% in RGDP C. The  $R^2$  of 97% reflects the standing of independent variables in explaining long-run real GDP per capita in Algeria. Also, as DW-statistic is greater than  $R^2$  we conclude that there is not autocorrelation.

A significant error correction term implies causality from openness, broad money (M2) to real GDP per capita. Within an error correction model, causality may arise from two channels. Short-run dynamics in the model are captured by the lagged differences, and conventional tests of causality may be based on the significance of these terms. The size and the significance of the error correction term in each equation show the tendency of each variable to enlarge economic growth.

A battery of diagnostic tests was also applied to the

In assessing the long-run relationship between economic growth and its determinants, we relied upon the CUSUM and CUSUM-squared tests proposed by [2] to test for constancy of long-run parameters. We applied the tests to the residuals of the model. The CUSUM test is based on the

cumulative sum of recursive residuals based on the first set of n observations. It is updated recursively and is plotted against the break points. If the plot of the CUSUM statistics stays within the 5% significance level, then the estimates are stable. The same applies to the CUSUM-squared statistics, which are based on the squared recursive residuals. As can be seen in Figs. 2 and 3, the plot of the CUSUM and CUSUM-squared statistics stay within the critical bounds indicating (represented by a pair of straight lines) the significant relationship between economic growth and its determinants.

### 5. Conclusion

This paper investigates the relationship between openness, financial development and economic growth in Algeria. As argued by many studies, our findings showed that openness is significant in explaining economic growth and supported by [9 and 19]. On the other hand, financial development is positive but insignificantly related to economic growth. This is a clear indication that financial development in Algeria has not affected economic growth significantly. This study therefore suggests that a viable financial system is needed for improvement of the Algerian economy.

From a policy perspective, the results suggest that, Algerian policy makers should focus on financial development and financial sector reforms to sustain steady economic growth in the country, regardless revenue of the hydrocarbons sector. A well-functioning financial institution can drive the economy to her desired height. Also, there is a dire need for the diversification of the economy to reduce over dependency on the hydrocarbon sector to guard against external shocks in terms of falling oil and gas price. Furthermore, future studies are required to apply better proxies to achieve better results.

### Appendix A

Exports of goods and services (% of GDP)

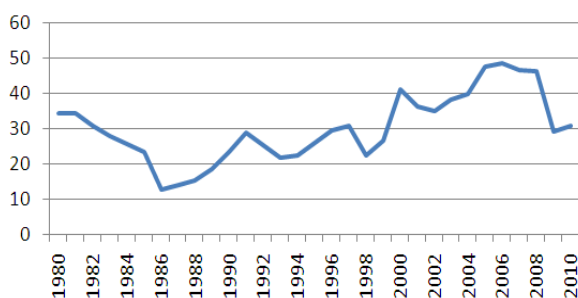


Figure 1. Exports of goods and services in Algeria (% of GDP) Source: world Bank, 2013.

Plot of Cumulative Sum of Recursive Residuals

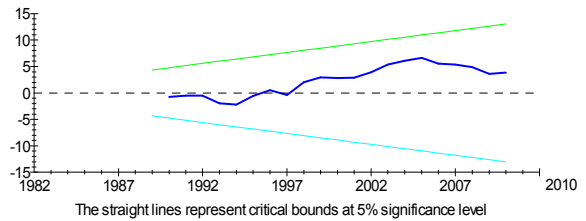


Figure 2. Plot of CUSUM

Plot of Cumulative Sum of Squares of Recursive Residuals

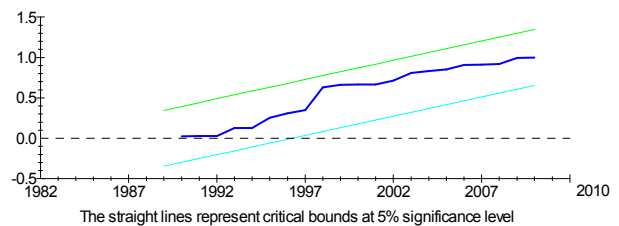


Figure 3. Plot of CUSUM-squared

Table 1. Unit Root Test (Augmented Dickey Fuller)

	Level		1 <sup>st</sup> difference	
	Constant	Constant & Trend	Constant	Constant & Trend
Lgcf	0.566977 (0.9863)	-2.217465 (0.4634)	-4.094761*** (0.0036)	-4.069755** (0.0173)
Llbr	0.173280 (0.9655)	4.179171 (1.0000)	3.017947 (1.0000)	-0.372919 (0.9832)
Lrgdpc	-0.426968 (0.8916)	-0.528129 (0.9763)	-3.413494** (0.0187)	-3.438574* (0.0658)
Lopen	-3.499496** (0.0163)	-2.719309 (0.2375)	-2.011168 (0.2804)	-1.273439 (0.8690)
Lbm	-1.307815 (0.6127)	-1.232786 (0.8850)	-4.135352*** (0.0033)	-4.062984** (0.0175)

Note: \* \*\* \*\*\* denote significance at 10%, 5% and 1% levels respectively. Values in parentheses represent p-value.

Table 2. The Bound Test

model	calculated F-statistic	Lag	significance level	Critical bound F-statistic	
				I(0)	I(1)
F <sub>v</sub> (Y K,L,OP,BM)	6.1237		5.0%	3.354	4.774
Likelihood Ratio Statistic	41.4981	2	1.0%		
Lagrange Multiplier Statistic	21.6394		1.0%		

Y denote RGDP, K= Gross Capital Formation, OP= openness, BM=Broad Money

**Table 3.** Long-run relationship and diagnostics tests

Lrgdpc	lgcf	lopen	lbr	llbr	intercept
-1.000	-0.049610 (0.0956)	1.0543 (0.40194) <sup>a</sup>	0.12180 (0.08024)	0.91805 (0.57438)	-10.3082 (8.2831)
Test	LM version	p-value	F version		p-value
Serial Correlation	CHSQ(1)= .52723	0.468	F(1, 22)= .39356		0.537
Functional Form	CHSQ(1)= .34666	0.556	F(1, 22)= .25719		0.617
Normality	CHSQ(2)= 1.3860	0.500			
Heteroscedasticity	CHSQ(1)= 2.0021	0.157	F(1, 28)= 2.0023		0.168
	R-Squared = 0.97373		DW-statistic = 1.7871		

Figures in parentheses ( ) indicate the standard errors. While, superscript denotes statistical significance at 5% level

**Table 4.** Error correction representation for the selected ARDL model

$\Delta \text{RGDPC}_t = -2.9193 - 0.014050 \Delta \text{lgcf}_{t-1} + 0.26000 \Delta \text{llbr}_{t-1} +$
(1.9929) (0.026082) (0.14762) <sup>b</sup>
$0.111444 \Delta \text{lopen}_{t-1} + 0.034495 \Delta \text{lbr}_{t-1} - 0.28321 \text{ecm}_{t-1}$
(0.077368) (0.030598) (0.096135) <sup>a</sup>
$R^2 = 0.56573$ DW-statistic = 1.6949

Standard errors in parentheses,  $\Delta$  means the first difference, and the superscript <sup>a</sup> and <sup>b</sup> denote statistical significance at the 1% and 10% levels, respectively.

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