# Regional Integration Effects on Investment and Growth in Algeria

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**Abstract:** The positive effect of financial development on growth has led several authors to advocate the liberalization of the financial sector from the constraints caused by repressive policies disturbing its operation. This policy will theoretically promote financial deepening, which will positively impact growth through increased savings and its allocation to more profitable sectors. The new requirements of the global economy have made economic and financial systems more integrated and liberalized, encouraged by the formation of regional groupings. The partnership between Algeria and the European Union (EU) could be a way of convergence and development for the banking system which has long been presented as a hindrance to the performance of the productive sector.

In this paper, we try to explore, through an empirical study, direct and indirect effects induced by integration into a broader regional free trade area, on investment and growth through improving financial system performance. The preliminary results show that trade openness has no direct effect on financial liberalization or growth, as the structure of the Algerian economy remains unchanged for a long period. However, financial integration improves financial variables (cash, bank credit, savings...) and therefore, investment and growth, as expected by economic theory.

**Keywords:** Growth theory, Financial and trade openness, Regional integration, econometric regression.

**JEL Classification:** C22, G21, G28

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## 1. Introduction

Inspired by Keynesian view, many countries have adopted after independence, interventionist policies centralizing financial resources and their management by capping interest rates, adopting credit restrictions and strict exchange controls and capital movements, in the aim of channeling savings to finance priority sectors. Lending rates have long been higher than deposit rates, discouraging savings and causing the development of the informal sector which led to weak financial intermediation, in addition to the underdevelopment or absence of financial markets. This impacted the real economy in these countries, weakening their productive system and increasing imports which exacerbated their dependency and indebtedness.

The theoretical foundation for such policies is the hypothesis that savings are the sources of investment and growth. The values of these variables were, up to the year 1970, closely related, but the opening and liberalization of markets and the acceleration of international capital flows, recorded after this period, have disconnected these aggregates.

It even gave a new perspective analysis of this phenomenon, making the ratio of savings and investment an indicator of the degree of international financial integration of a country [Feldstein and Horioka (1980)].

Thus, developing economies witnessed low growth rates because of the inability of their financial systems to ensure a balance between the real and financial spheres and in their limited opening to the world. Added to the weakness of their productive systems and the lack of diversification of their economies, domestic savings were rare. External capital flight could not bridge the saving gap due to the adoption of repressive financial policies favoring the dominance of the state and the various controls it exerts on the system [Shaw (1973), McKinnon (1973), Levine (2000, 1996), Lucas (1988)…]. Various studies suggested that these systems ought to adopt liberalization and openness for greater accountability, profitability and economic performance, citing the positive impact of this option on the performance of countries adopting it.

Algeria followed this process by applying the structural adjustment program (SAP), which conditioned the support of international financial institutions at the beginning of the 1990s. Then, it strengthened its policy by signing association agreements with the EU, aiming to create a free trade area in 2010, as a first stage of international integration. Thus Algeria, like many other countries, proceeded gradually by opening, first, on a regional space before deploying on international markets. Moreover, these partnership programs provide developing countries with both technical and financial support.

In this paper, we test empirically the existence of a relationship between the Algerian regional integration to the Euro-Mediterranean area with investment and growth. We assume that this integration can be a potent stimulator especially for foreign investment through improving the performance of the Algerian financial system.

## 2. Theoretical justification and econometric analysis.

Theoretical and empirical studies related to the relationship between finance and growth are very numerous and varied. We empirically investigate for the case of Algeria the existence of a link between integration to a wider economic area (EU) and the liberalization of the financial system and growth. Our work draws on the models used in the literature related to the relationship between liberalization and growth, integration and growth, and dynamic integration of financial markets, among others.

We subscribe to the logic of the literature, arguing that financial liberalization promotes growth as it finances businesses in greater quantities and better time and costs, while stimulating competition between different funding sources [Cho Yoon (1986), Fry (1997), Galbis (1977), Klein and Olivei (1999)...]

Additionally, the effect of capital account liberalization (external liberalization), was examined by a large number of studies such as in Paul (2000) and Klein and Olivei (1999). The first study identified a positive relationship between capital account liberalization and growth. The latter led to the same conclusion for industrialized countries depending on the existence of a set of institutions that accompany the changes induced by the free movement of capital. Arteta et al. (2001) and Edwards (2001) have deepened this contribution to conclude that the effects of the opening of the capital account on growth are more favorable in high and middle-income countries than in developing and poor ones.

We consider in our study that the degree of openness to international trade affecting the absorption of new investments by the economy depends on the financial sector's ability to cope with this openness as measured by the level of income per head of population. Interest rates are also important determinants of savings decisions and thus long-term investment.

Their influence on spending firms, investment and household consumption is essential in the cycle of economic activity and in the development of macro-economic policies. Eliminating regulations that kept interest rates artificially low contributed to the rise in real interest rates and in savings.

In general, global financial markets integration leads to the convergence of these rates. In addition, the willingness to save may be highly dependent on the financial sector's ability to offer a wide variety of financial assets more suitable to the needs of investors. The impact of financial liberalization on transactional volumes is justified by the various possibilities of choice in the absence of distortions (control, limitations etc. . .). Effects that may arise are mainly noted at predictable interest rates, inflation, reducing financial transactions costs, developing financial intermediaries and entrepreneurial activity that leads to innovation, which in turn, increases the efficiency of production and therefore, growth.

This perspective of economic and financial liberalization had a growing influence on international institutions like the IMF and the World Bank, to the extent that liberalized economies have outperformed closed economies' investment rates. Liberalized economies could also benefit from direct investment inflows and higher financial income, contributing to greater liquidity in domestic markets and thus to a decrease in the risk premium on securities issued, which contributes to a reduction in the cost of capital needed to finance investments. These elements can serve as an incentive for greater integration of poor countries into the world economy. Indeed, recent decades have seen the evolution of the global economy towards the liberalization option even for countries that were unfavorable to it. Regional integration will be expected to facilitate or harmonize the movement of people, goods, services and capital.

These policies have mutual benefits for partners. For developed countries, they reduce the handicap of insufficient market size, provide an opportunity for return on investment, and a place of concentration of raw materials and human capital. For developing economies, they provide technology transfer, capital inflow correcting the scarcity of domestic savings, a stimulant to local firms facing foreign competition, and improvements to the quantity, quality and costs of products offered to consumers. However, they are also carriers of sacrifices and risks to the weaker countries if they are not adequately prepared for the opening and liberalization requirements by upgrading their production and financing systems. Thus, integration projects are generally accompanied by technical and financial assistance for the benefit of disadvantaged parties in order to achieve convergence of their systems.

All these developments have brought Algeria to the integration process by seeking to associate

itself in a concerted structural framework in a free trade area with the European Union before the WTO. The influence of the European Union (EU) in world trade and the privileged historical links maintained, lead us to restrict our study to the case of regional economic integration in this area.

The EU proposed in 1995 to the countries of the Mediterranean region a new partnership that goes beyond unilateral trade concessions of the 1970s, carrying out an opening to the South, in the perspective of building a regional space with Mediterranean third countries crowned by the free trade area (FTA). It is in this context that we want our study to examine if the changes induced by the integration project of Algeria to the Euro-Mediterranean area have an impact on the financial system and growth, by boosting the economic and institutional reforms already launched in 1990.

In 1993, Algeria initiated an agreement with the IMF and the World Bank, a program of economic reforms with political liberalization and financial transformation undertaken by monetary authorities. These changes have greatly affected the structure of markets and Algerian financial sector policies.

These policies were highly repressive as the government intervened and distorted market mechanisms (cap rate credits and mandatory credit allocation and management of portfolios of banks ...). As part of the partnership with the EU, Algeria hopes to support and complete the reforms of the financial sector, allowing the establishment of private financial institutions, improving banking supervision and modernizing prudential regulation. Implementation of external financial liberalization is the final stage of the program designed for greater openness (Washington Consensus). It could lead to significant cost savings in terms of instability and crises, hence the choice to a gradual evolution of application of this reform.

Indeed, financial reform in Algeria focused on indirect instruments of liquidity management and the attractiveness of local currency assets through the liberalization of interest rates and credit. This reform has improved competitiveness by encouraging private banks and insurance companies' activity, but also enhancing profitability and security ratios and prudential regulation.

Theoretically, there is a strong dependency relationship between the growth rate of a country and the strength of its financing system. Problems in the financial system may decrease the effectiveness of monetary policy, weigh heavily on the budget by the bailout of troubled financial institutions, causing capital flight and deepening the recession, as was the case during the period of repression. This reinforces the importance of the financial sector and its impact on the real economy.

However, this vision of liberalization based primarily on raising interest rates to increase savings and prevent capital flight, has also been widely criticized. In developing countries, saving is only slightly elastic to interest rates because financial systems are not sufficiently developed and sophisticated providing a range of investment products. It is precisely on this point that we rely considering that this program of cooperation and Euro-Med partnership could provide an incentive framework for the banking sector particularly in Algeria. Expertise, experience and the European funding can actively participate in the upgrading of services and bank performance, to improve their participation in the investment financing wealth creator factor....

## 3. Presentation of the econometric methodology and variables used

We will examine the hypothesis of a link and causality between trade and financial openness, financial development and growth. Among the empirical works in this direction, those of Arestis and Demetriades (1997), Hansson and Jonung (1997) Neusser and Kugler (1998), who used time series based on standard tests unit root and Engle and Granger cointegration (1987) or Johansen (1996) Error Correction Models.

Their objectives were to determine the existence of a long-term relationship between finance and growth, then the direction of this relationship by applying causality tests. These are recent techniques of time series analysis based on studying variables with the determination of trends, stability or change over time in order to predict their future evolution.

We chose to use the method (VAR) for the advantage offering us the possibility to test the existence of a long-term relationship between the respective variables even if they are not all, stationary, as precisely is the case of macroeconomic variables of our estimation. The approach followed is to integrate two groups of variables, measuring regional integration and financial liberalization, and use them to test the relationship with growth. Regional integration is represented by the trade openness variable (OP) assessed by the sum of imports and exports relative to GDP, but also financial integration by foreign direct investment (FDI). The financial liberalization has several dimensions and its measurement is based on various ratios taking its dimensions.

The first of these ratios is the liquidity of the economy (LIQ) showing the current money stock M2 relative to the level of nominal GDP. It measures the extent of monetization transactions. This indicator has been criticized because the M2 money supply can grow relatively compared to the nominal output, but can't always be a sign of an efficient financial sector.

The second variable contains the private sector credit to GDP (CP) measuring the ability of the banking sector to provide funding to the private sector, knowing that in repressed economies, funds are directed to sectors ranked strategic by the government. The third is the ratio of financial savings (EP), determined by the ratio of savings to GDP. By increasing the real interest rate or by offering new products and services to capital owners, banks attract more savings which is an important source of financing investment and therefore, growth.

According to the measures recommended by the various works related to financial liberalization, interest rates determined by market forces encourage greater savings collection. But due to lack of data on this variable, we use the Consumer Price Index (CPI) to measure the inflation rate. The real interest rate equals the nominal interest rate minus the inflation rate. The other proxy is the bank loans relative to total local economy credits (CB) evaluating the ability of the banking sector to finance the activity, compared to other agents (e.g. Treasury).The last indicator of financial development is the ratio of monetary circulation reported to M2 (CF), measuring the liquidity of the economy and the use of various payment instruments. Growth (Y) will be measured by the average annual change in the Gross Domestic Product (GDP). To facilitate the task, we summarize the different variables as follows:

Y = Economic growth (GDP),

LIQ = Liquidity of the economy (M2/GDP)

CP = Credit to private sector (CP / GDP)

CB = Bank loans / total domestic credit to the economy (CB / CLE)

EP = National savings (savings / GDP)

CF = Circulation (CF/M2)

CPI = Evolution of the average price index (CPI)

IDE = Financial Integration by foreign direct investment (FDI / GDP)

OP = Trade or Business Integration (Expo + Imp. / GDP)

We use the database of the World Bank (WDI 2011, GDF 2011), IMF (IFS 2008), especially that we complement by those of the Bank of Algeria when needed. It is annual statistics covering the period

1970 to 2011. To run the model, we will use the Eviews 6 Software.

## 4. Findings

In this point, we will use a simple regression model to estimate econometrically the relationship between the integration of Algeria to the Euro-Mediterranean regional area and the liberalization of its financial system, and their effect on growth. The VAR process which defines this relationship is written as a set of equations linking the variables summarized above, in the following formulation: t = 1, ...42.

$$\ln Yt = \beta_0 + \beta_1 \ln(LIQ)_t + \beta_2 \ln(CP)_t + \beta_3 \ln(CB)_t + \beta_4 \ln(EP)_t + \beta_5 \ln(CF) + \beta_6 \ln(IPC)_t + \beta_7 \ln(IDE)_t + \beta_8 \ln(OP)_1 + \varepsilon_t$$

(1)

The implementation of the model is done by conducting a series of tests; we select for the purposes of this analysis those of stationarity to check the validation of the model, causality, variance decomposition, and finally, the shocks.

### 4.1. The stationarity test (unit root test)

We begin by testing the stationarity of the variables and determine their integration. This amounts to studying the temporal evolution of the actual process by taking away the influence of time. The Dickey-Fuller tests are the most used because of their simplicity, based on the estimation of an autoregressive process. We test first the null hypothesis of unit root differentiated series. If this hypothesis is rejected, we should test the null hypothesis of a unit root undifferentiated series. We will test for each variable from the regression Dickey -Fuller, represented in the following general form, H0, $\pi$i = 0 against H1, $\pi$i < 0 , i = 1,2, ... N.

$$\Delta y_{i,t} = \pi_i \cdot y_{i,t-1} + \sum_{t=1}^{n-1} b_i \cdot \Delta y_{i,t-1} + \mu_i + \gamma_i \cdot t + \varepsilon_{i,t}, \quad i = 1,2,...,N, \quad t = 1,2,...,T$$

(2)

The unit root tests results and delay are summarized in Table (1).

**Table 1 Dickey-Fuller test results**

| Variables | Level test | 1stdiffrence | 2nddiffrence | Conclusion |
|---|---|---|---|---|
| **LIQ** | 0.052 [0.6932] | -4.3116 [0.0001] | / | I (1) |
| **CP** | -0.6977 [0.4078] | -4.5112 [0.0000] | / | I (1) |
| **CB** | 4.4429 [1.000] | -2.3483 [0.0202] | / | I (1) |
| **EP** | 0.4468 [0.8058] | -5.5937 [0.0000] | / | I (1) |
| **CF** | -1.8211 [0.0657] | -6.7283 [0.0000] | / | I (1) |
| **IPC** | 4.7455 [1.000] | -1.1668 [0.2174] | | I (1) |
| **IDE** | -2.6219 [0.0102] | / | / | I (0) |
| **OP** | -0.0069 [0.6778] | -4.0388 [0.0002] | | I (1) |
| **Y** | 11.7424 [1.000] | -1.1927 [0.2087] | -6.5531 [0.000] | I (2) |

I (0) Level stationary, I (1) stationary in first differences

Stationarity tests of the different variables provide a first-order stationarity for all variables except the financial integration variable (IDE) that is stationary at I (0), and the growth (Y) at second order I (2). This allows us to test the cointegration relationship between them, using the response test VAR.

## 4.2. The cointegration test

Before testing the existence of cointegrating relationship between our variables, we must have the VAR model order that helps to identify relationships. We use the Akaike and Schwartz criteria for offsets H from 0 to 4, and we keep the models for which these criteria are minimized. We'll take the stationary series, respectively denoted d (d (y) ) d ( cb ) d ( cf ) d ( cp) of (cpi ) d ( ep) ide ( fl ) d ( op ), and proceed to test with delays of 0 to 4. The results are shown in the following table.

**Table 2 Delay number determination results**

| Variable | Akaike | Schwartz |
|---|---|---|
| **Delay 01** | 54,55 | 58,55 |
| **Delay 02** | 52,02 | 59,70 |
| **Delay 03** | 00,00 | 00,00 |
| **Delay 04** | / | / |

The best estimate of the VAR model minimizing the Akaike and Schwartz criteria, according to the parsimony principle, is that with a delay of 02. This means that our variables are determined based on those values and other variables current and past two time periods.

Now, we estimate the vector autoregression model to determine any long-term relationships between the different variables used. The model estimation leads us to write equations linking the variables together. We have the same number of equations and variables, but we will resume only the

most significant:

d(d(y)) = - 0.473*d(d(y(-1))) - 0.468*d(d(y(-2))) + 12.047*d(cb(-1)) + 20.248*d(cb(-2)) + 22.831*d(cf(-1)) - 6.723*d(cf(-2)) - 0.907*d(cp(-1)) - 4.435*d(cp(-2)) - 24.019*d(cpi(-1)) + 33.998*d(cpi(-2)) - 23.642*d(ep(-1)) + 16.337*d(ep(-2)) - 200.699*ide(-1) + 199.999*ide(-2)-33.949*d(liq(-1)) + 37.511*d(liq(-2)) + 0.725*d(op(-1)) + 2.507*d(op(-2)) + 2.298

d(ide)=- 4.231-05*d(d(y(-1))) + 0.0005*d(d(y(-2))) - 0.015*d(cb(-1)) - 0.0264*d(cb(-2)) - 0.018*d(cf(-1)) - 0.078*d(cf(-2)) + 0.004*d(cp(-1)) + 0.0001*d(cp(-2)) + 0.001*d(cpi(-1)) + 0.029*d(cpi(-2)) + 0.064*d(ep(-1)) + 0.053*d(ep(-2)) + 0.283*ide(-1) + 0.171*ide(-2) + 0.058*d(liq(-1)) + 0.025*d(liq(-2)) + 0.022*d(op(-1)) - 0.003*d(op(-2)) + 0.110

(3)

Combining these equations with the VAR cointegration relations test results, and noting that statistically, the most significant values for the VAR test are those with absolute Student Statistics value at risk of 5% is greater than 1.96, we note the following relations:

Variables with greater influence on other variables are those of financial integration (IDE), inflation (CPI), and liquidity (LIQ), respectively. Indeed, FDI is the most influential variable across the model because significantly intervening in determining the value of bank credit (BC), growth (Y), and the liquidity (LIQ) but also other financial variables. Inflation (CPI) is significantly important for determining the value of bank credit (BC), and savings. Indeed, the CPI influences real interest rates, which in turns, affect bank credits (BC). Bank liquidity (LIQ ) is the third influential variable on both the circulation (FC), bank credit ( BC) and credit to the private sector (CP ), while bank credit ( CB ) is influenced by CPI , FDI lagged one period, but also the (CP), and liquidity, lagged two periods.

Thus, we find that financial liberalization variables influence each other, to varying degrees. Inflation for example, is influenced by the private credit, liquidity of the economy and the circulation.

The circulation, is influenced by inflation, liquidity lagged one period and trade opening two periods. This reflects logically that trade openness creates new financing needs of firms, and inflation plays on the configuration of savings. The variable credit to the private sector (CP), is weakly related to others. Moreover, the equation raises a relative bank lending and FDI influence by stimulating private credit demand and inflation as interest rates parameter. This is also justified by the fact that it is the banks autonomy but also investment regulations which influenced the most on this variable, although growth and openness should have a role in influencing the banks financial situation, which boosted the credit.

For trade openness (OP), it is also weakly related to other variables, because of lack of diversification of the economy, although the equation shows more noticeable presence of FDI, inflation (CPI), and liquidity (LIQ). Indeed, FDI contributes to the diversification, and inflation affects the imports value, and liquidity (LIQ) facilitates the exchange operations. It also has a particular influence on the (CF) and (LIQ), by export earnings.

The growth value (Y) is related to its own values delayed two periods, FDI delayed one and two periods and liquidity. FDI is linked to the values of circulation lagged two periods and LIQ one period. Conversely, liquidity depends on its variables, IDE and CF; so, the three variables CF, LIQ and IDE are related to each other, as predicted by the theory.

### 4.3. The causality test

Causality tests allow us to see if there is a causal relationship between variables. The table below shows, with the null hypothesis, the different causal relationships between variables. We accept results with a probability of 5%. For our purposes, we will select the relations describing the causality between variables opening, financial liberalization and growth. Thus, we notice no Granger causality found between the trade openness variable (OP) and other variables. All probabilities of these relationships are above the threshold of 5%. This shows, as expected, that trade openness has no direct causal effect with financial liberalization.

**Table 3 Trade openness causality test results**

| | | | |
|---|---|---|---|
| D(OP) does not Granger Cause D(CB) | 40 | 1.12644 | 0.3375 |
| D(CB) does not Granger Cause D(OP) | | 1.31999 | 0.2822 |
| D(OP) does not Granger Cause D(D(Y)) | 40 | 0.00091 | 0.9991 |
| D(D(Y)) does not Granger Cause D(OP) | | 0.74684 | 0.4828 |
| D(OP) does not Granger Cause D(CF) | 40 | 0.01711 | 0.9830 |
| D(CF) does not Granger Cause D(OP) | | 0.79830 | 0.4594 |
| D(OP) does not Granger Cause D(CP) | 40 | 0.04935 | 0.9519 |
| D(CP) does not Granger Cause D(OP) | | 0.29023 | 0.7502 |
| D(CPI) does not Granger Cause D(OP) | | 0.17992 | 0.8362 |
| D(OP) does not Granger Cause D(EP) | 40 | 1.69474 | 0.2008 |
| D(EP) does not Granger Cause D(OP) | | 0.21661 | 0.8065 |
| D(OP) does not Granger Cause IDE | 40 | 0.97164 | 0.3901 |
| IDE does not Granger Cause D(OP) | | 0.59691 | 0.5569 |
| D(OP) does not Granger Cause D(LIQ) | 40 | 0.73982 | 0.4857 |
| D(LIQ) does not Granger Cause D(OP) | | 0.47708 | 0.6252 |

Same conclusion for the financial openness variable (FDI), with the exception of a causality that runs from the IDE to the liquidity of the economy, with a probability of 0.0146, in fact, FDI is an additional source of liquidity to the economy. In the other direction, it is a causality that runs from the circulation and savings FDI we find with probabilities 0.0006 and 0.048%, respectively.

**Table 4 Financial openness variable causality test results**

| | | | |
|---|---|---|---|
| D(LIQ) does not Granger Cause IDE | 40 | 0.24792 | 0.7820 |
| IDE does not Granger Cause D(LIQ) | | **4.88382** | **0.0146** |
| IDE does not Granger Cause D(D(Y)) | 39 | 0.54050 | 0.5882 |
| D(D(Y)) does not Granger Cause IDE | | 2.90271 | 0.0709 |
| IDE does not Granger Cause D(CB) | 39 | 2.32162 | 0.1155 |
| D(CB) does not Granger Cause IDE | | 0.83185 | 0.4450 |
| IDE does not Granger Cause D(CF) | 40 | 0.05073 | 0.9506 |
| D(CF) does not Granger Cause IDE | | **9.50746** | **0.0006** |
| IDE does not Granger Cause D(CP) | 40 | 1.34340 | 0.2762 |
| D(CP) does not Granger Cause IDE | | 1.37276 | 0.2689 |
| IDE does not Granger Cause D(CPI) | 40 | 0.08649 | 0.9174 |
| D(CPI) does not Granger Cause IDE | | 0.03689 | 0.9638 |
| IDE does not Granger Cause D(EP) | 40 | 1.44248 | 0.2523 |
| D(EP) does not Granger Cause IDE | | **3.35032** | **0.0486** |
| D(OP) does not Granger Cause IDE | 40 | 0.97164 | 0.3901 |
| IDE does not Granger Cause D(OP) | | 0.59691 | 0.5569 |

For the growth variable, we note that it is only caused by the CB with a probability of 0.04, while it does

not cause any other variables. Bank credit, as a financing economic activity parameter by the banking sector, it makes sense to turn it into growth.

**Table 5 Growth causality test results**

|     | Y     | CB    | CF    | CP    | CPI   | EP    | IDE   | LIQ   | OP    |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| **Y**   | **37.60** | **14.42** | 2.44  | 1.38  | **9.60**  | 2.75  | **16.25** | **11.09** | 4.44  |
| **CB**  | **10.40** | **46.62** | 0.82  | 2.73  | **11.32** | 2.35  | **18.06** | 5.51  | 2.15  |
| **CF**  | **12.06** | 7.699 | **36.74** | 4.17  | 6.34  | 6.82  | **8.90**  | **9.86**  | **7.36**  |
| **CP**  | 5.91  | **26.77** | 2.59  | **37.54** | 5.20  | 5.15  | 7.481 | 5.30  | 4.02  |
| **CPI** | 2.79  | **43.81** | 2.25  | **26.48** | **14.39** | 1.69  | 0.95  | 6.37  | 1.21  |
| **EP**  | **16.13** | **17.74** | 6.14  | 5.01  | **16.21** | **17.52** | **11.34** | 5.31  | 4.57  |
| **IDE** | **13.22** | **11.61** | 1.99  | 4.75  | **22.94** | **10.42** | **25.65** | 7.316 | 2.06  |
| **LIQ** | **10.39** | **10.36** | 3.28  | **10.57** | 7.44  | **13.74** | **19.76** | **13.22** | **11.20** |
| **OP**  | **13.11** | 8.60  | **13.27** | 7.75  | **13.16** | 7.39  | 7.37  | 3.11  | **26.20** |

## 4.4. The variance decomposition test

This test defines the dependence relationship between variables which was already noted by cointegration and causality tests. It tells us about the variance of the forecast error for each variable, and allows us to know the share of each variable in the variation of another variable. For our model, we chose the Cholesky test, after twelve years. The values given by the test are summarized in the following table:

**Table 6 Summary of Cholesky test results**

|     | Y     | CB    | CF    | CP    | CPI   | EP    | IDE   | LIQ   | OP    |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| **Y**   | **37.60** | **14.42** | 2.44  | 1.38  | **9.60**  | 2.75  | **16.25** | **11.09** | 4.44  |
| **CB**  | **10.40** | **46.62** | 0.82  | 2.73  | **11.32** | 2.35  | **18.06** | 5.51  | 2.15  |
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| **EP**  | **16.13** | **17.74** | 6.14  | 5.01  | **16.21** | **17.52** | **11.34** | 5.31  | 4.57  |
| **IDE** | **13.22** | **11.61** | 1.99  | 4.75  | **22.94** | **10.42** | **25.65** | 7.316 | 2.06  |
| **LIQ** | **10.39** | **10.36** | 3.28  | **10.57** | 7.44  | **13.74** | **19.76** | **13.22** | **11.20** |
| **OP**  | **13.11** | 8.60  | **13.27** | 7.75  | **13.16** | 7.39  | 7.37  | 3.11  | **26.20** |

From the data table, we conclude that the error variance of the variable CB is set up to 46.62% of its own values, 18 and 10% respectively from those of FDI and growth. CF is determined for 36% of its own values and 12% of those of Y, 9 and 10% for FDI and liquidity (LIQ). CP depends on its own values and CB respectively for 37.54 and 26.77%. The IPC is more related to the values of CB for 43%, those of CP 26%, and that of his own values to 14, 39%. We note the low share of trade openness (OP) in defining other variables except LIQ, because of the recycling of oil revenues. For the financial integration (IDE), it is very present in the most variables except for the CPI, CP and the OP. This confirms the importance of financial integration in the stimulation of financial liberalization and improving banking and financial system performance. Moreover, as we have seen, (IDE) is caused by savings (EP) and circulation (CF), while it causes the liquidity of the economy (LIQ). According to the test, its value is based for 25 % of its own values, CPI for 22%, growth 13%, CB 11% and 10% EP. We also note that the growth (Y) is defined at 37.60 % by its own values, 14.42%, 16% and 11%, and 9.60 % from those of the CB, the IDE, LIQ and CPI respectively. In contrast, growth is present in almost all values of financial liberalization and integration. Finally, the results of this test confirm those we have developed through the cointegration and causality tests. We proceed to test impact analysis to

determine the response variables.

### 4.5. Impulse response test

This test informs us about the reaction on all the variables following a shock introduced on one of them, over a given period. However, because our statistics are annual, we will limit our exercise to five years. Also, we will limit the tests to shocks occurring particularly on financial integration variables to see the effect on other variables. Trade integration, as we have seen in previous tests, has not had a significant influence.

**Table 7 IDE impulse response test results**

| Periode | D(D(Y)) | D(CB) | D(CF) | D(CP) | D(CPI) | D(EP) | D(LIQ) |
|---------|---------|-------|-------|-------|--------|-------|--------|
| 1 | 0.000000 | 0.288286 | 0.123280 | 0.035759 | 0.099820 | 1.113987 | -0.522085 |
|   | (0.00000) | (0.77975) | (0.34925) | (1.22029) | (0.25034) | (0.72152) | (0.59967) |
| 2 | -71.09464 | 2.645509 | -0.040413 | 0.336713 | -0.140411 | -1.314809 | 2.575423 |
|   | (34.5866) | (1.02812) | (0.37800) | (1.54700) | (0.38126) | (0.97073) | (0.89252) |
| 3 | 58.45168 | 1.237512 | 0.166118 | 1.270923 | -0.007007 | 0.662852 | 1.348897 |
|   | (49.8972) | (1.09411) | (0.41246) | (1.69773) | (0.51290) | (0.98857) | (0.95516) |
| 4 | 79.94601 | 0.248470 | -0.785744 | 0.086943 | 0.199786 | 0.875887 | -0.884136 |
|   | (54.0630) | (1.15825) | (0.43163) | (1.68363) | (0.65840) | (1.09563) | (1.12533) |
| 5 | 22.64743 | 0.198000 | -0.200898 | 0.082806 | -0.116264 | 0.731145 | -0.952361 |
|   | (51.2724) | (1.16113) | (0.43340) | (1.64228) | (0.72328) | (0.97541) | (1.12042) |

We note that following a shock equal to one standard deviation for financial integration (FDI), it will have no effect on growth during the first period, while in the second year, the growth response will be -71 and 58, the third year,79.9 and 22 the fourth, the fifth year.

These values are very important because of the dominance of FDI in determining those of growth. The response variable bank credit (BC) is 0.288 in the first year, 2.64 in the second and it starts to decline in subsequent years. A similar trend is recorded by the response of the private credit and liquidity. Other variables CPI, CF, ICP, and EP have variant responses from one year to another, without continuing trend, due to the weak relationship of these variables with FDI. We saw that the causality runs from CF and EP to FDI, not vice versa, in the causality test.

## 5. Conclusion

The plea for openness and financial liberalization in emerging economies, from the Washington Consensus, has been extended to the issue of financial systems modernization and governance as the main transmission channel of growth. Indeed, in theory, through liberalization and openness of financial systems, the lack of capital should govern the size and allocation of foreign capital flows, leading to transfer savings to poor countries, thereby correcting the two main weaknesses of developing economies, through increasing first domestic and foreign savings, and secondly, its assignment to more profitable sectors.

Algeria has long followed a "financial repressive policy", which has led to macroeconomic and financial disequilibrium that will continue to get worse, especially with the oil shock of 1986. At the end of this period, stabilization policies and structural adjustment under the leadership of international financial institutions have been engaged, based on trade and financial liberalization, to stimulate the development of an effective domestic financial market and reduce the volume of the external debt. This policy was reinforced during the negotiation of the Partnership Agreement with the EU, as part of a new

perspective of relations between the two sides of the Mediterranean, opened by the Barcelona Process in 1995. The objective of this agreement was to strengthen the financial integration of the economy and the convergence of its systems through the transfer of technology and skills by improving the attractiveness of the country. Add to this, the technical and financial support accompanying the implementation of reforms.

In fact, the empirical analysis has shown that the regional integration of Algeria, especially its financial component (FDI density), is closely linked to the financial liberalization values, much of which is also responsible for growth. Also, IDE is the variable that is the most influential on the model and significantly involved in determining the financial variables. This confirms the importance of financial integration in the stimulation of financial liberalization and improving banking and financial system performance. Also, relative to the mono exporter character of the economy, trade openness (OP) is only weakly related to other variables. At the end, the growth value (Y) is related mainly to those of IDE, liquidity, savings and trade openness.

Furthermore, another causal relationship is also confirmed from Bank credit (CB) to growth (Y); as a criterion of economic activity financing by the banking sector, it is logical to turn into growth. Thus, our results are significantly closer to the theoretical arguments outlined above, concerning the regional integration (in our case, especially financial) influence on the structure of monetary and financial variables (bank credit, liquidity of the economy, savings and circulation), which, subsequently, influence growth.

We validate our hypothesis that regional integration, through improving system performance, induces a better foreign investment attraction, which positively influences the financial system, and hence growth. In other words, financial integration introduces a dynamic in the process of economic growth through the strengthening of financial liberalization. However, the weakness of the representativeness of savings and credit to the private sector, while they are regarded as theoretically important variables of financial liberalization, confirms the fact that the process of liberalization in Algeria is not yet fully completed. Low liberalization of capital movements, the insignificant share of the financial market, and the persistence of the predominance of public banks in the sector's activity, are all points that it would be beneficial to correct. This adds to the unfinished modernization of the Algerian financial system, and the limited resilience of asset markets, which continue to limit the intermediation of domestic savings satisfactorily. It is precisely why we consider that this Euro-Med program could serve as a stimulating framework for banking and financial sector development. Expertise, experience and European funding can actively participate in the upgrading of services and bank performance.

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