

Does Foreign Direct Investment Impact Economic Growth?
An Empirical Study in Algeria

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Abstract: This paper aims to study the relationship between economic growth and foreign direct investment in Algeria during the period 1990-2015 using statistical techniques. The results show the positive impact of foreign direct investment in Algeria in the period under study. Finally, the paper recommends stimulating the foreign investor and providing a suitable environment to activate the foreign investment climate in Algeria.

Keys Words: Foreign direct investment, Economic growth, co-integration.

المخلص: تهدف هذه الورقة إلى دراسة العلاقة بين النمو الاقتصادي والاستثمار الأجنبي المباشر في الجزائر خلال الفترة 1990-2015 باستخدام الأساليب الإحصائية بالإعتماد على اختبار التكامل المشترك. وقد أظهرت النتائج التأثير الإيجابي للاستثمار الأجنبي المباشر في الجزائر في الفترة محل الدراسة. وفي الأخير أوصت الدراسة بضرورة تحفيز المستثمر الأجنبي، وتوفير البيئة المناسبة لتفعيل مناخ الاستثمار الأجنبي في الجزائر.

الكلمات المفتاحية: الاستثمار الأجنبي المباشر، النمو الاقتصادي، التكامل المشترك.

I. Introduction:

Foreign direct investment plays an important role in economic growth, in this context globalization offers an unprecedented opportunity for developing countries to achieve faster economic growth through trade and investment.

The theory provides conflicting prediction concerning the growth effect of foreign direct investment, the economic rationale for offering special incentives to attract foreign direct investment frequently derives from the belief that foreign investment produces externalities in the form of technology transfers and spillovers.

For example, (Romer,1993) argues that there are important "idea gaps" between rich and poor countries, he notes that foreign investment can ease the transfer of technological and business know-how to poor countries, these transfers may have spillover effects for the entire economy (Maria Carkovic and Rose Levine,2002). so FDI boost the productivity of all firms(not just those receiving capital) (Rappaport, 2000)

In other hand, some theories predict that FDI will hurt resource and slow growth (Boyd and Smith, 1992).

In the light of above, what is the impact of FDI on Economic Growth in Algeria? and does FDI accelerate Algerian Economic Growth?

- **Objectives of study:** the main objectives of this study is to:
 - Analyze the impact of FDI on economic growth in Algeria.
 - Consider the relationship between FDI and Economic growth.
- **Hypothesis of study:**
 - FDI has a positive effect on Algerian economic growth.
 - There is a long relationship between FDI and economic growth in Algeria.

II- Literature Reviews:

In particular countries, some microeconomic studies find that FDI doesn't boost economic growth, so they don't find a positive spillovers running from foreign owned to domestic owned firms, like the study of (Harrison and Aitken, 1999) which find no evidence of a positive spillover from foreign firms to domestic firms in Venezuela between 1979-1989, in the other hand, in macroeconomic studies, like study of (Borensztein and Lee, 1998) find that FDI has a positive effect on growth when the country has a highly educated workforce that allow it to exploit FDI spillovers. In contrast, (Blomstrom, Lipsey and Zejan, 1994) find that FDI has a positive effect on growth when country is rich.

(Li and Liu, 2005) study, using a single equation and simultaneous equation techniques, have examined the relationship between FDI and economic growth on a panel data for 84 countries for the period 1970-1999, and they have find a positive impact of FDI on economic growth through its interaction with human capital in developing countries, and a negative impact of FDI on economic growth through its interaction with technology gap. In 2007, Mottaieb study which was about "determinants of FDI and its impact on economic growth in developing countries", find that economic growth can be significantly affected by FDI. Similarly, the study carried out by (Archanun Kohpaiboon, 2008) about the impact of FDI on growth performance in investment receiving countries, a case study of Thailand over the period 1920-2000, find that growth impact of FDI tends to be greater on export promotion trade regime compared to import substitution regime.

II. Research Methodology:

In order to analyze the basic relationship between FDI and output, a simple Cobb-Douglas production function were used with adding a several variables:

$$Y = F(K, L) \dots \dots \dots 1$$

Where: Y: Gross Domestic Product (GDP)

K: Capital Stock

L: Labor Force.

While the FDI has an impact on capital stock and can has impact on total factor productivity,so we have added FDI as variable,so the function(1) became:

$$Y=F(K,FDI,L).....2$$

Were: FDI: Foreign Direct Investment

While data series on capital stock is not available in all year under study in Algeria, we have employed the ratio of gross fixed domestic investment to GDP as proxy variable represent "k", so the function (2) became:

$$Y=F(DI,FDI,L).....3$$

Were: DI: Domestic Investment.

While the economic opness in the country has an effect on investment ,we have added the degree of Algerian economic opness as variable to equation,so :

$$Y=F(DI,FDI,L,EO).....4$$

Were :EO: Economic Opness.

Accordingly, the estimating equation used in this study is:

$$GDP=\beta_0FDI^{\beta_1}DI^{\beta_2}L^{\beta_3}EO^{\beta_4}U.....5$$

Were: U:Stochastic Error Term

β_1 : Output elasticity respect to FDI(impact of FDI on growth).

β_2 : Output elasticity respect to DI.

This model includes the log of gdp per capita(as mesure of economic growth),real FDI and real DI. To achieve the objectives of study ,many procedures have been suggested for determining the appropriate lag length in a dynamic model by including the Akaike Information Criterion (AIC) and Schwartzs Criterion (SC). Before estimating the model ,some priliminary tests are applied like: unit root test, stability test.

III. RESULTS AND DISCUSSION:

1. Unit Root Test:

to test the existence of unit root hypothesis in the time series under study,we have have applied two test: augmented ducky fuller and philips perron test wich the both test the asymptomatic hypotes(H_0), which provides for the existence of a unit root (no stationarity of time series) (Gujarati and Porter, 2009) through the t test .the result showed in table 1:

TABLE1:FINAL RESULTS OF UNIT ROOT TEST

| variables | Test | Level of stacionarity | |
|-----------|--------------------------|-----------------------|---------------------|
| | | ADF | PP |
| EG | With intercept | I(1) ^{**} | I(1) ^{**} |
| | With intercept and trend | I(1) ^{**} | I(1) ^{**} |
| | None | I(1) [*] | I(0) ^{***} |
| FDI | With intercept | I(1) ^{**} | I(1) [*] |
| | With intercept and trend | I(1) ^{**} | I(1) ^{**} |
| | None | I(1) [*] | I(1) [*] |
| DI | With intercept | I(1) [*] | I(1) ^{**} |
| | With intercept and trend | I(1) [*] | I(1) ^{**} |
| | None | I(1) [*] | I(1) [*] |
| L | With intercept | I(1) ^{***} | I(1) ^{**} |
| | With intercept and trend | I(2) ^{**} | I(1) ^{**} |
| | None | I(1) ^{**} | I(0) ^{***} |
| EO | With intercept | I(1) [*] | I(1) ^{**} |
| | With intercept and trend | I(0) ^{**} | I(1) ^{**} |
| | None | I(1) [*] | I(1) [*] |

SOURCE: Prepared by the researcher, depending on the Statistical Package EVIEWS7.

Notes: *,**,*** level of significant at 1%,5%,10%.

Trought the previous results,comparing the ADF result and PP results,we show that all time series under study are stationary at first difference : I(1).

In this regard,it should be noted that there is a long relationship between all variables under study(FDI,DI,L,EO) with economic growth(EG) (the stationarity of all variables at same level),so thus can estimate the cointegration test.

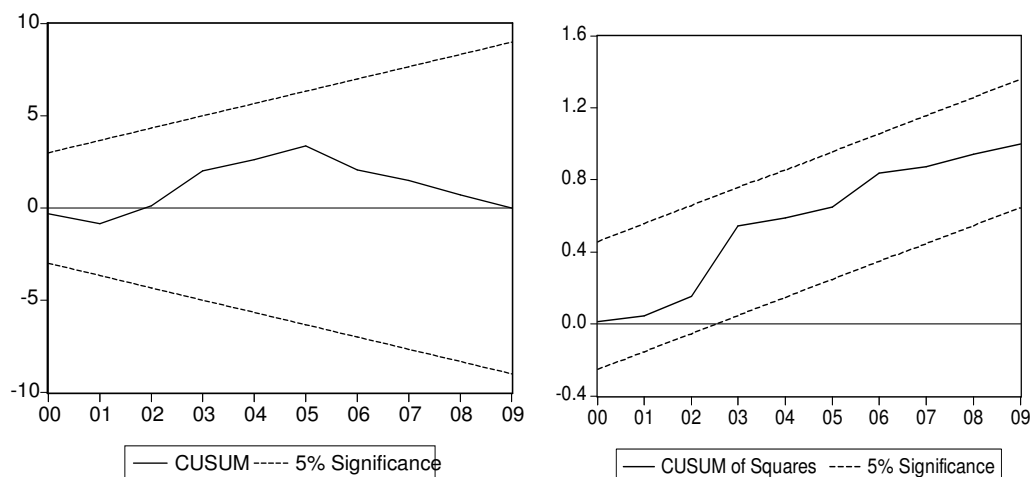
2. Stability test:

From previous unit root test results,we have found that all variables are stationary at same level(I(1)), wich may lead to the presence of unexpected changes in the variables behavior over time(

Malawi,2006), which makes it imperative to test the stability of the time series during the period under study. For this we have used cusum and cusum square test.

From both experimental stability (show fig 1), the results show that the model parameters enjoying a high stability over the period 1990-2015, there is no need to divide the period under study to a partial periods in which the parameters are stable. thus allow us to use the entire period without fragmentation.

FIG1: CUSUM AND CUSUM SQUARE TEST



Source: Prepared by the researcher, depending on the Statistical Package EVIEWS7

3. Lag length selection test:

To determine the number of periods of slowdown time, we will be relying on a standard AKAIK(AIK), SCHWARTZ(SIC), THE STANDARD HANAN-QUINN(HP), as well as THE STANDARD FINAL PREDICTION ERROR(FBE), these indicators choose the period in which the lower values are for these indicators, in addition to the average test for possible standard ratio(LR) which tests the hypothesis that the periods of deceleration time parameters combined unexplained statistically using distribution(χ^2) from the largest number of periods time dilation and stop at the period in which the parameters are explained.

The results of this test, have indicated one time period slowdown as shown in the table(2)

Which will be taken into account in subsequent tests.

TABLE2: Lag length selection results

| HQ | SC | AIC | FPE | LR | LogL | Lag |
|-----------|-----------|-----------|-----------|----------|-----------|-----|
| 4.779590* | 5.018121* | 4.782104* | 7.175752* | NA* | -30.86578 | 0 |
| 4.911969 | 5.198206 | 4.914986 | 8.367934 | 0.004060 | -30.86240 | 1 |

SOURCE: Prepared by the researcher, depending on the Statistical Package EVIEWS7

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

4. Johansson co-integration test:

Multivariate co-integration test procedure require that the time series for all variables be integrated at the same rank and unstable.

Johansen test aims through a test Walther and Great distinctive values to detect the number of vectors quality, by comparing tabular and calculated values as shown in the following table:

TABLE 3: Johansson co-integration test:

| H_0 | Eigen values | H_1 | Calculated values | Critical values | H_1 | Calculated values | Critical values |
|------------|--------------|---|-------------------|-----------------|---|-------------------|-----------------|
| | | | Trace test | | Maximal eigenvalue test | | |
| $r=0$ | 0.8656 | There is only one vector of the joint integration** | 54.3907 | 47.21 | There is only one vector of the joint integration** | 28.1038 | 27.07 |
| $r \leq 1$ | 0.6668 | There is only two vector of the joint integration | 26.2869 | 29.68 | There is only two vector of the joint integration | 15.3873 | 20.97 |
| $r \leq 2$ | 0.5315 | There is only three vector of the joint integration | 10.8996 | 15.41 | There is only three vector of the joint integration | 10.6152 | 14.07 |

SOURCE:: Prepared by the researcher, depending on the Statistical Package EVIEWS7.

**::Indicated the reject of null hypothesis H_0 at 5%.

From the result showing in table 3, confirm the non-acceptance of null hypothesis in both tests , which means the existence of the common vector of integration between the variables in the long term. Based on this condition check, lead us to the adoption of the ordinary least squares method in the estimation of the model.

5. The results of the model estimation:

Before estimating the model using ordinary least squares method, there must be some measurement tests pertaining to this method:

A. Lagrange Multiplier Test of Residual "Breush-Godfrey(BG)":

This test is applied to make sure if there is no problem of serial correlation in the model, and it is evidence that the slowdown time period selected is optimal (Breush,1978).

The Null hypothesis (H_0) in this test provides the absence of serial correlation between the errors in the model, and it will be accepted when statistical probability value "BGLM-STAT" is greater than 1%. As shown in the following table:

Table4: Lagrange Multiplier Test of Residual

| Prob | LM-Stat | Lags |
|----------|----------|------|
| *0.4843 | 0.489185 | 1 |
| * 0.6326 | 0.228494 | 2 |
| * 0.3710 | 0.800457 | 3 |
| *0.1957 | 1.673984 | 4 |
| * 0.9555 | 0.003110 | 5 |
| * 0.5104 | 0.433345 | 6 |
| * 0.1366 | 2.216274 | 7 |
| * 0.6017 | 0.272368 | 8 |
| * 0.4235 | 0.640471 | 9 |
| * 0.7112 | 0.137032 | 10 |
| * 0.0896 | 2.881762 | 11 |
| * 0.3989 | 0.711521 | 12 |

SOURCE: statistical package (EViews 7) output

Notes: Probs from chi-square with 1 df.

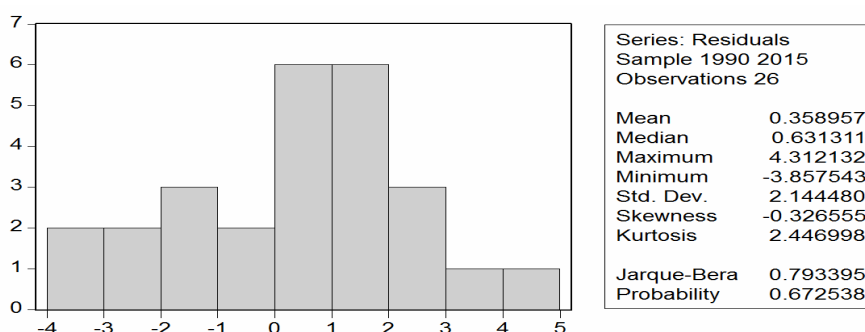
*: Unacceptable statistically significant at the 1% level

From the results showing in table(4),all statistical probability values "BGLM-STAT" are greater than 1%,so we accept the null hypothesis wich provide t he absence of serial correlation between the errors in the model.

B. Normal distribution of random errors test"Jarque-Bera(JB)":

This test is intended to determine if they random errors normally distributed in the applicable model equation,so wi will test the null hypothesis wich provide that the random error is normally distributed .,and we accept the nul hypothesis when statistical probability value "JB-STAT" is grether than 5% (Jarque and Bera,1987) ,as showing in the following fig:

FIG3: Jarque-Bera(JB) test



Source: Statistical Package(EViews7) output.

Through the results, we note that statistical probability value "JB-STAT" is greater than 5%, so we accept the null hypothesis which provides that random error is normally distributed.

C. Estimating results of impact of foreign direct investment :

After estimating the model using ordinary least squares method, the results show that foreign direct investment has a statistically significant positive impact on economic growth in Algeria, in addition to a high explanatory variables.

IV. Summary:

Through econometric study of the impact of FDI on economic growth in Algeria, it shows that foreign direct investment has a positive impact on Algerian economic growth. In this context, we recommend encouraging foreign direct investments by stimulating the foreign investor, and provide a suitable environment to activate the foreign investment climate in Algeria through privileges and tax exemptions.

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