

the Gravity Model and FDI in Algeria

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Abstract:

This paper estimates the determinants of foreign direct investment flows using the gravity equation in Algeria, and controlling the importance of each of the traditional gravity variables (size, common borders, distance, and common language) and other institutional variables such as landlockness and government effectiveness to foreign direct investment flows to know the efforts made by Algeria to attract it and raise the volume of its flows necessary for the development of its national economy.

The study aimed to determine the usefulness and feasibility of foreign direct investment in the host countries and to evaluate the performance of foreign direct investment and its role in the growth of GDP in Algeria during the period (2011-2020) in order to determine the factors that determine the decision of multinational companies to establish new foreign branches in Algeria.

The study concluded that foreign direct investment has an influential role in economic growth (Gross National Product), and this is consistent with the logic of economic theory, as it appears in the empirical results that prove the validity of the hypothesis that the model variables are important determinants of foreign direct investment flows.

keywords: Foreign Direct Investment, Gravity Model, Panel data.

I- Introduction:

In recent years, one of the main objectives in the agenda of international organizations and local governments has been to identify policies that reduce poverty, improve the quality of life of citizens around the world and promote growth. In the light of this ambitious goal, globalization and technological innovations are considered critical issues because they create new and more investment opportunities for enterprises and at the same time increase the competition by countries to attract investments (i.e. foreign direct investment, FDI).

While attracting foreign direct investment has been a primary goal for the State of Algeria for a long time, despite the reforms, amendments and modernization of legislation regulating investment for more than 20 years and the provision of more advantages and incentives to investors, the results of this did not reach the target level, so the volume of flows varied between the Maghreb countries. Which is largely due to the privatization processes that took place in these countries, as there were a set of obstacles that led to the distortion of the business environment and caused the volume of foreign financial flows to be restricted, and this called the State of Algeria to implement special strategies to attract more flows of foreign direct investment, and expedite them and its embodiment.

The gravity model is one of the most successful experimental techniques in the international economy in the past decades, and this model has been widely applied in international trade, and then its application has increased in many fields such as foreign direct investment, tourism and migration flows. It has also been employed in many economic studies related to exports of goods and products that move across regions and national borders, and in various circumstances. Unfortunately, despite the wide use and appreciation of this model to some extent, its use for making various economic decisions and policies encountered many obstacles and difficulties, and this situation remained until later studies came that worked to develop and find the theoretical framework For this model, I focused on deriving it mathematically, to make it more widely used and to make its results more realistic.

This simple model, which has been widely used in the analysis of trade, has known many applications, including testing the normative theories of trade, and others to explain trade and the impact of some political measurements on the volume of exchange. It was also applied to the intra-flows of foreign direct investment, and this is what we will discuss in this study.

The problem of the study revolves around: What is the impact of the gravity model on Algeria's attraction of foreign direct investment? In an attempt to answer this problem, the study presented the following basic hypotheses:

- The gravity model plays an effective role in analyzing the intra-flows of foreign direct investments;
- Algeria is a leading country in attracting foreign direct investment.

This study also seeks to achieve the following objectives: Giving a comprehensive concept of the gravity model of foreign direct investment; Attempting to find solutions to attract more foreign direct investment by analyzing and treating the results of the gravity model.

The importance of the research comes from the importance of the topic it deals with, which is the attractiveness model of foreign direct investment, because of its importance in the possibility of analyzing and classifying data, and from it can highlight areas and factors that are characterized by great attractiveness to foreign direct investment.

As for the study methodology, the study relied on the descriptive analytical approach, as it is one of the most appropriate scientific approaches to study this problem, in addition to the use of statistical methods and programs, including EVIEWS11, EXCEL, to study and analyze the results of the gravity model of foreign direct investment in Algeria during the period The place of study (2010-2020) .

1. The theoretical framework of the study.

Foreign direct investment is one of the most important relatively recent topics, and most economists agree on the great role that this type of investment plays in developing the productive capacities of its host countries. As a result of the positive effects of this type of investment, the host countries have provided all possibilities in order to encourage the largest international companies to invest in It has also worked hard to create appropriate conditions such as eliminating customs barriers and facilitating various administrative difficulties that help increase the demand for foreign investors.

1.1 foreign direct investment :

A foreign direct investment (FDI) is an investment in the form of a controlling ownership in a business in one country by an entity based in another country , It is thus distinguished from a foreign portfolio investment by a notion of direct control.

1.1.1 Definition of foreign direct investment :

Foreign direct investment (FDI) is defined as an investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate). (**World Investment Report 2007, 2007, p. 245**)

1.1.2 Determinants of FDI :

Determinants of FDI is side as well as growth prospectus of the economy of the country when FDI is made. Hymer proposed some more determinants of FDI due to criticisms, along with assuming market and imperfections.

These are as follows:

Firm-specific advantages: Once domestic investment was exhausted, a firm could exploit its advantages linked to market imperfections, which could provide the firm with market power and competitive advantage.

Removal of conflicts: conflict arises if a firm is already operating in foreign market or looking to expand its operations within the same market. He proposes that the solution for this hurdle arose in the form of collusion.

Propensity to formulate an internationalization strategy to mitigate risk: According to his position, firms are characterized with 3 levels of decision making: the day to day

supervision, management decision coordination and long term strategy planning and decision making. The extent to which a company can mitigate risk depends on how well a firm can formulate an internationalization strategy taking these levels of decision into account.

1.1.3 Types of FDI :

Horizontal FDI : arises when a firm duplicates its home country-based activities at the same value chain stage in a host country through FDI.

Platform FDI : Foreign direct investment from a source country into a destination country for the purpose of exporting to a third country.

Vertical FDI takes place when a firm through FDI moves upstream or downstream in different value chains i.e., when firms perform value-adding activities stage by stage in a vertical fashion in a host country.

1.1.4 Importance and barriers to FDI :

An increase in FDI may be associated with improved economic growth due to the influx of capital and increased tax revenues for the host country. Besides, the trade regime of the host country is named as a important factor for the investor's decision-making. Host countries often try to channel FDI investment into new infrastructure and other projects to boost development.

1.1.5 The COVID-19 crisis will cause a dramatic drop in foreign direct investment (FDI) in 2020 and 2021:

It will have an immediate negative impact in 2020, with a further deterioration in 2021. Global FDI flows are forecast to decrease by up to 40 per cent in 2020, from their 2019 value of \$1.54 trillion. This would bring FDI below \$1 trillion for the first time since 2005. FDI is projected to decrease by a further 5 to 10 per cent in 2021.

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WHO is at the forefront in leading the global fight against the COVID-19 from the start by tracking the growth, coordinating global information exchange, and providing technical support to countries. By the end of January 2020, 20 countries, territories and areas had reported cases of COVID-19. The number quickly rose to 54 by the end of February, and to 202 by the end of March. By 30 April 2020, 212 countries, territories and areas had reported COVID-19 cases and 174 had reported at least one death from COVID-19. In total there are 3,059,642 cases of infection and 211,028 deaths reported. COVID-19 has spread to all continents except Antarctica, and fewer than 30 countries, territories or areas (mostly in the Pacific islands) have reported no COVID-19 cases.

So Global merchandise trade volumes and values were showing modest signs of recovery since late 2019 when the global economy was hit by the measures taken to contain the COVID-19 pandemic. UNCTAD newscasts for global trade and FDI values

point to a fall of 3.0 per cent in the first quarter of 2020 with respect to the previous quarter. Most of the impact of these measures, however, will affect global trade in the second quarter of the year, with an estimated quarter on- quarter decline of 26.9 per cent. (ANGELA & Haishan, 2020, pp. 10-22)

Global flows of foreign direct investment (FDI) will be under severe pressure this year(2020) as a result of the COVID-19 pandemic. These vital resources are expected to fall sharply from 2019 levels of \$1.5 trillion, dropping well below the trough reached during the global financial crisis. (World Investment Report 2020, 2020, p. 03)

1.2 FDI in Alegria :

The process of foreign direct investment is not a random process, but rather it is subject to a set of determinants and controls that govern it, and attractive factors that distinguish each country from the rest. Algeria has confirmed through Legislative Decree No. 93-12 to attract and stimulate foreign direct investment and follow a policy Openness as the main engine for building the national economy.

1.2.1 Evolution of FDI in Alegria(2010-2020) :

Improving the investment climate in any country is directly reflected in the increase in foreign direct investment inflows to this country, but with Algeria heading towards a market economy, improving the security situation and paying attention to the incentives granted to foreign investors, foreign direct investment flows to Algeria began to increase during the period 2010-2019. Despite the legislative decrees to promote investment adopted by Algeria, foreign direct investment recorded a weak volume of flows and declined during the period 2019-2022 due to the Corona pandemic (Covid-19) that the world knew and had an impact on the decline of many economic sectors, In 2019, the Foreign Direct Investment (FDI) inflows in Algeria exceeded 1.38 billion current U.S. dollars, decreasing compared to the previous year. Within the period examined, the FDI inflow in the country experienced some fluctuations and peaked at around 2.75 billion U.S. dollars in 2009. On the other hand, the lowest value was observed in 2015, at approximately minus 538 million U.S. dollars.(<http://www.unctad.org>)

This can be seen from the following graph:

Fig.1. Algeria's foreign direct investment flows



Source: Prepared by the researcher based on information available on the site:

<https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx>, consulted on 23/01/2021.

The graph 1 shows the inwards and outwards FDI in the **Algeria**. As we can see, it is clear that there was a decline in incoming FDI inflows to Algeria in the period (2010-2015) due to the drop in oil prices, except for the year 2015, which witnessed a sharp decline, estimated at -584.5 million dollars, and then began to rise after this year until 2019, when it was estimated With \$1381.8 million. While the outflows of foreign direct investment from Algeria during the period 2010-2019 were qualitatively stable, with a slight increase in 2011, estimated at 534 million dollars, as well as in 2018 with 880 million dollars.

1.2.2 Origin of FDI entering Algeria:

The Algerian government is trying hard to attract FDI in sectors that may create jobs and reduce the imports of assembled goods. Several sectors are targets for foreign investors, including the automobile industry and the renewable energy sector.

Nevertheless, since 2008 there are many FDI restrictions. Until 2019, for each new investment project in Algeria, the majority of its capital (51%) had to be held by local partners; however such limitation has been lifted (except for “strategic sectors” such as hydrocarbons, mining, defense, and pharmaceuticals). The Algerian government has enacted protectionist economic policies (import quotas for several types of products). Nevertheless, in recent years Algeria has benefited from the support of the World Bank to improve its business climate. (**guide investir en algerie, 2019, p. 56**)

1.3 The Gravity Model :

The Newtonian law of gravitation states that two celestial bodies are subjected to a force of attraction that is directly proportional to their mass and indirectly proportional to their distance. In the 1960s, (**Wolfgang Jacoby, 2009, p. 01**) H. Carey was the first to apply the Newton’s law of universal gravitation to the study of human behavior and

subsequently the so-called “gravity equation or model” has been widely used in the social science. Later, social scholars have transferred the gravity equation to the empirical analysis of international trade flows. In particular, Tinbergen (1962), (**Simone, Michel, & Jesus Fernandez, 2014, p. 02**) use a simple form of gravity model of bilateral trade in analyzing bilateral trade flows. Since then, the gravity equation has also been applied to flows of people and capital (direct and indirect).

Empirically, the econometric developments of the gravity model, which tend to take account of the increased availability of data over time, help inform which panel methods are appropriate. (**Marie M, 2010, p. 13**)

1.3.1 Model Specification :

The most simple form of the gravity model of bilateral trade is:

$$F_{ij} = A Y_i Y_j / D_{ij} \quad (1)$$

where:

- **F_{ij}** : represents the flows (i.e. migration, tourism, trade, foreign direct investment) between the home country i and the host country j; (**Lucie, 2014/2015, p. 07**)
- **A** : is a constant of proportionality;
- **Y_i** and **Y_j**: are the relevant economic sizes (GDP, GDP per capita, Population) of countries (i,j);
- **D_{ij}**: is the distance between countries’ capitals or economic/financial center.

Equation (1) states that bilateral flows between country i and country j are directly related to the product of the countries’ GDP (Y_i and Y_j) and inversely related to their distance (D_{ij}).

Tinbergen (1962) was the first to apply this formula to analyze international trade flows. Later, Linneman (1966) included population as an additional measure of country size, defining the *augmented gravity model*.

This model is generally estimated in a log linear form which provides elasticity of bilateral trade to income (GDP: Y_i, Y_j), country size (Population: POP_i, POP_j) and distance (D_{ij}).

1.3.2 Augmented Gravity Equation:

$$\ln X_{ij} = \ln (\alpha_1 + \beta_1 \ln(Y_i) + \beta_2 \ln POP_i + \beta_3 \ln Y_j + \beta_4 \ln POP_j + \beta_5 \ln D_{ij} + u_{ij}) \quad (2)$$

where:

- $\ln X_{ij}$ is log of trade or foreign direct investment flows;
- $\ln Y_i, Y_j, \ln POP_i, \ln POP_j$ are logs of the relevant economic size;
- $\ln D_{ij}$ is the distance between countries' capitals or economic/financial centre;
- u_{ij} : normal error terms with mean zero and variance σ_u^2

Usually other variables are introduced to expand the basic gravity model. For instance, variables are added to control, for linguistic, cultural and historical similarities, regional integration, common financial development and structure, and common currency. (مبطوش و مداني، 2014)

$$\ln X_{ij} = \alpha_0 + \alpha_1 \ln Y_i + \alpha_2 \ln POP_i + \alpha_3 \ln Y_j + \alpha_4 \ln POP_j + \alpha_5 \ln D_{ij} + \alpha_6 \ln Language + \alpha_7 Institutional + U_{ij} \quad (3)$$

2. The experimental framework for the study.

We will introduce the model variables in this aspect in order to arrive at its own gravitational equation.

2.1 Empirical Methodology

Our study sample is made up of 14 countries, over a period from 2010 to 2020. Thus with $N = 14$ and $T = 11$, we will obtain a panel with 261 observations. ($N \times T = 261$). We rely on a panel data analysis. With panel data analysis, different effects on FDI across countries and over time can be investigated, allowing for heterogeneity control.

Panel data possess some advantages over cross-sectional or time series data. Panel data can address issues that cannot be addressed by cross sectional or time-series data alone. highlighted the following advantages of panel data over cross sectional or time-series data: (HAMMACHE & Mustapha, 2018, pp. 549-550)

- Panel data control for heterogeneity, they give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency
- They are able to identify and measure effects that are simply not detectable in pure cross-sectional or pure time series data.
- Panel data models allow us to construct and test more complicated behavioral models than purely cross-sectional or time-series data.

Basically, the static panel data models can be estimated using :

1. Ordinary Least Square (OLS)
2. Fixed Effects (FE) and
3. Random Effects (RE)

This study covers the fourteen countries, in the period (2010-2019), where:

European countries: Italy, Spain, France, turkey, Belgium.

Arab countries: Egypt, Tunisia, Morocco.

North America: United States – Canada.

Latin America: Brazil.

Asia: China-Japan.

2.2 Variables Description:

The core idea of the gravity model is to model the bilateral FDI on the distance and size of the two trading countries, analogically to the Newton's law of universal gravitation. In our model, the dependent variable is thus the FDI flows of Algeria, whereas the main independent variables are GDPs of the two countries and their mutual distance.

However, as argued in many gravity model studies, such model would be too simplistic, as it does not account for other barriers to FDI flows for the distance. Therefore, our model is augmented by other distance-measuring variables (landlockness and government effectiveness), institutional indices (government effectiveness index), economic variables (common currency and recession dummy), and last but not least by common language and common colonial history dummies. The complete list of our variables is presented in Table 01 below.¹ For detailed variables description and the methodology.

Table 1. Variables description

	Variable	Values	Unit	Source
1	log(FDI as dependent variable)		log	www.unctad.org
2	log(GDP partner)		log	www.unctad.org
3	log(GDP Algeria)		log	www.unctad.org
4	log(distance)		Km	CPII
5	common language	0/1	dummy	CPII
6	common border	0/1	Dummy	CPII
7	common political history (colony)	0/1	Dummy	CPII
8	landlockness (no direct sea access)	0/1	Dummy	CPII
9	government effectiveness	(-2.5/2.5)	percent	World bank
10	common currency (dinar)	0/1	dummy	Own estimation

Source: Prepared by the researcher

2.3 Model Specification :

In this paper, a log-log version of the gravity model is employed in order to obtain some coefficients as elasticities (GDP and distance). The model is designed as follows:

ln fdi = Foreign direct investment flows to Algeria from the countries covered by the study sample.

J=1 ,.....,14 stands for the partner country

T= 2010,.....,2019 represents time (years)

Note that some variables do not have t index, since they are time-invariant (distance, language, contiguity, colony and landlockness). We have to omit these in the fixed effect estimation due to multicollinearity with the intercept.

So our equation is :

$$\log(FDI_i) = \log(FDI_j) + \log(GDP_i) + \log(GDP_j) + \log(DIST) + \log(gov\ eff) \\ + comlang + combor + comcol + land + comcur + C$$

3.Variables Hypotheses :

Let us now have a look at the expected relationship between selected variable, according to previous published results or economic theory.

It is rather intuitive that exports rise proportionately with the economic size of the destination. In gravity modeling, we use GDP as a proxy of economic size, so the relationship is expected to be analogous. An interesting experiment is presented by Head & Mayer (2013) who observe relationship of Japanese exports and imports to each EU member state. They do this by simply plotting export and import value against GDP in 2006 and they found out a very good fit (85% and 75%, respectively). Moreover, the elasticity is very close to 1 (1.001 and 1.03, respectively). Actually the same experiment was repeated for years 2000-2009 and the average elasticity value was 0.98. As Japan is very distant from the EU and it does not share language, currency, border or colonial history, this result is expected to be purified from other influence. Also the meta analysis by Head & Mayer (2013) supported this finding when the average coefficient at GDP of origin (i.e. the exporter) was 0.98 over 700 regressions included.

The expected effect of distance, trade barriers and recession is expected to be negative, while common language, border, currency or colonial history should enhance the exports. In addition, we also include governmental effectiveness index measuring the level of institutional development and effectiveness. Proper institutional background is expected to further support the international trade, as indicated by a study from Wu et al. (2011). These authors found that countries with better governance environment (called as rule-based countries) trade more than relation-based or family-based countries whose rule of law are weaker.

4. RESULTS :

This research paper presents commented numerical results. We apply various estimation techniques that were discussed above to Algeria panel dataset of exports to 14 countries within 11 years (2010-2020). Firstly, we estimate the model under the time-series data structure using the whole dataset (261 observations). This enables us to compare the

performance of different estimators on our particular dataset. Based on the data characteristics and assumption violations, some estimators are considered as unreliable, while others as preferable. The most suitable estimator appears to be the Hausman-Taylor estimator due to its ability to deal with data issues in the most comprehensive and reliable way.

4.1 Various Estimation Methods :

Stability of Time Series (Unit Root Test):

We must test the stability of a time series and cross-sectional through reliance on various tests most commonly used (Augmented Dickey- Fuller ADF) (Phillips & Perron PP) and we found the results shown in the following table:

Table (2) : Unit Root Test

The screenshot shows the EViews software interface with the 'ADF Fisher Unit Root Test on UNTITLED' window. The window displays the following information:

- Null Hypothesis: Unit root (individual unit root process)
- Series: FDI1, FDI2, FDI3, FDI4, FDI5, FDI6, FDI7, FDI8, FDI9, FDI10, FDI11, FDI12, FDI13, GDPI, GDP1, GDP2, GDP3, GDP4, GDP5, GDP6, GDP7, GDP8, GDP9, GDP10, GDP11, GDP12, GDP13, DIST, GOVEFF, COMLAG, COMBOR, COMCOL, LAND, COMCUR
- Date: 02/19/21 Time: 18:09
- Sample: 2010 2019
- Exogenous variables: Individual effects
- Automatic selection of maximum lags
- Automatic lag length selection based on SIC: 0 to 1
- Total number of observations: 261
- Cross-sections included: 30 (5 dropped)

Method	Statistic	Prob.**
ADF - Fisher Chi-square	90.9357	0.0061
ADF - Choi Z-stat	-2.41980	0.0078

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results UNTITLED

Series	Prob.	Lag	Max Lag	Obs
FDI1	0.1280	0	1	9

Source: Prepared by the researcher, depending on the program EViews11, 2021.

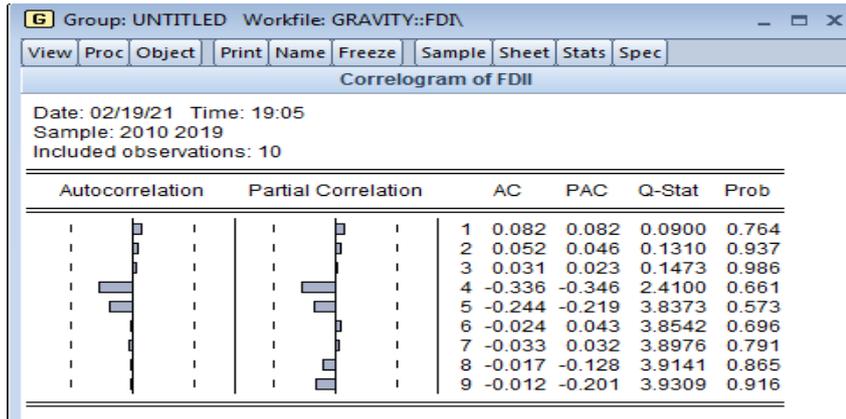
We note from Table No. (2) the absence of a unit root at the level of studying the time series variables: foreign direct investment, distance, language, neighborhood, population, which indicates the stability of these variables at the level, while there are integrated variables of the first degree at the 1% level, The results show that there are two variables: GDP and government effectiveness.

Results shown in the table indicate absence of cointegration between the integrated variables studied in the same class, and this is what we observe through statistical ADF shows the rejection of the alternative hypothesis and accept the null hypothesis, so there is no cointegration inside (90.9357). It also statistical group ADF shows there is no cointegration between (Indiv.Ar), so accept the null. Probabilities for fisher tests are computed using an asymptotic chi-square distribution. all other tests assume asymptotic normality.

test of correlogram:

After testing stability and the presence of some of unstable and integrated variables of the same class, which grow in the same direction in the long term, and that leads us to correlation Test between these variables, results are as follows:

Table (3) :test of correlation



Source: Prepared by the researcher, depending on the program EViews11, 2021.

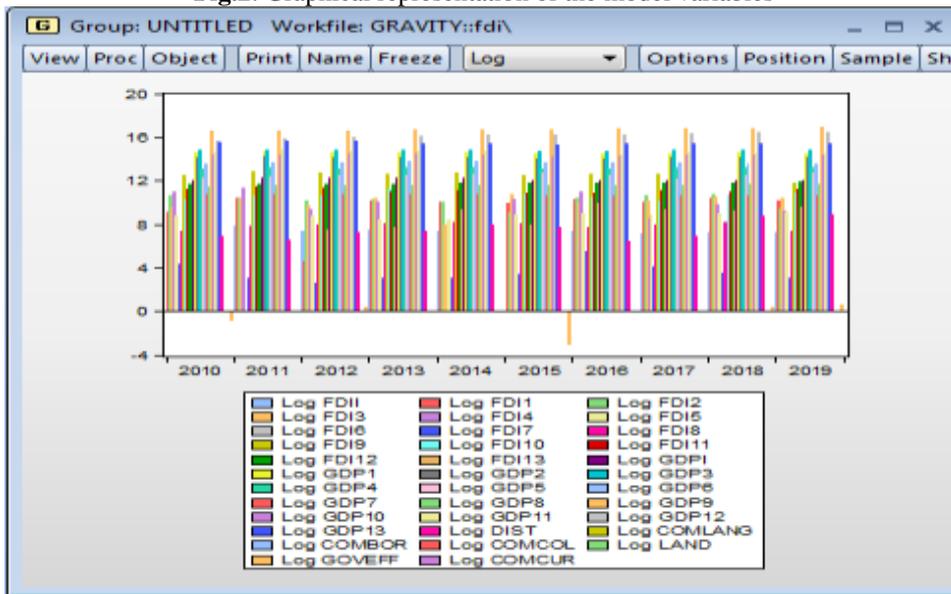
By observing the graphic representation of the correlation, it shows us that all the coefficients of the partial and autocorrelation functions within the confidence and statistical domain (Q-stat) have greater than significant probability = 0.05, and from it the residuals represent random shocks.

It appears from the results of the analysis of Table No. (3) for correlation and autocorrelation analysis, and the results also show that the rate of change in the domestic product of the countries that invest in Algeria by 1% leads to an increase in the proportion of foreign direct investment by 0.08%, and that the rate of change in the population factor by 1% leads to an increase in investments by 0.031%.

As for the parameter of the size of the GDP of the countries that invest in Algeria, it was positive, and it is identical to the economic theory, as the economic theory indicates that the increase in the volume of GDP in countries means that there is an increase in income and thus the ability of individuals to invest in different countries increases.

As for the population variable of the countries that invest in Algeria, the parameter of this variable is positive, with good statistical significance. Because more population means more investment; In numbers, a population change of 1% leads to an increase in investment by approximately 0.76%, that is, the greater the population of countries that invest in Algeria, the more attractive Algeria will be to foreign direct investment.

Fig.2. Graphical representation of the model variables



Source: Prepared by the researcher, depending on the program EViews11, 2021.

Table (4) : Statistical analysis of model variables

we must make a set of statistical tests on the variables in the model and the study sample.

View	Proc	Object	Print	Name	Freeze	Sample	Sheet	Stats	Spec											
				FDI	FDU	GDPi	GDPj	DIST	COMLANG	COMBOR	COMCOL	LAND	GOVEFF	CONCUR						
Mean			1471.699	22273.42	183532.7	2056609.	2441204	0.300000	0.200000	0.300000	0.000000	0.650000	0.100000							
Median			1503.090	24163.19	174036.8	2085980.	1451137	0.000000	0.000000	0.000000	0.000000	0.730000	0.000000							
Maximum			2560.626	34323.80	213810.0	2291991.	6747.007	1.000000	1.000000	1.000000	0.000000	1.730000	1.000000							
Minimum			-584.5280	92.51003	160034.2	1835899.	642.7219	0.000000	0.000000	0.000000	0.000000	-0.420000	0.000000							
Std. Dev.			636.0682	10505.27	21928.03	139504.8	2296.248	0.483046	0.421637	0.483046	0.000000	0.772313	0.316228							
Skewness			-1.354321	-1.000112	0.349511	-0.109382	1.217765	0.872872	1.500000	0.872872	NA	0.003272	2.666667							
Kurtosis			5.020222	3.113157	1.368499	2.220327	2.836120	1.761905	3.250000	1.761905	NA	1.487924	8.111111							
Jarque-Bera			4.757514	1.672374	1.326316	0.273228	2.482777	1.908541	3.776042	1.908541	NA	0.952673	22.73663							
Probability			0.092666	0.433360	0.515222	0.872307	0.288983	0.385093	0.151371	0.385093	NA	0.621054	0.000012							
Sum			14716.99	222734.2	1835327.	20566092	24412.04	3.000000	2.000000	3.000000	0.000000	6.500000	1.000000							
Sum Sq. Dev.			6291091.	9.93E+08	4.33E+09	1.75E+11	47454784	2.100000	1.600000	2.100000	0.000000	5.368290	0.900000							
Observations			10	10	10	10	10	10	10	10	10	10	10							

Source: Prepared by the researcher, depending on the program EVIEWS11, 2021.

$$\log(FDI_i) = 0.433(FDI_j) + 0.515(GDP_i) + 0.872(GDP_j) + 0.288(DIST) + 0.621(gov\ eff) + 0.385lang + 0.151bor + 0.385mcol + 0.0001cur + 8.051$$

Conclusion :

In this research paper, we studied the effect of the gravity model on foreign direct investment in the Algerian country. We used comprehensive data analysis as an investigation methodology. Where our study identified the main determinants and obstacles to foreign direct investment flows in Algeria using the econometric estimation technique "gravity model" on the data of the Algeria panel and 14 countries dealing with it from 2011 to 2020, there is a positive and significant impact of the volume of inward flows of foreign direct investment on GDP in Legal system framework, property rights index, trade openness and a common currency.

The results of estimating the standard gravity model indicated that there is a positive relationship between the size of GDP and foreign direct investment, and there is a positive relationship between foreign direct investment and the population in those countries, that is, an increase in income or population in those countries increases investment. The results of the model also indicated that there is an inverse relationship between the distance variable and foreign direct investment, and an inverse relationship also between the dummy variables represented by the common language and co-colonization and between foreign direct investment.

Algeria has become an important step for investors who want to invest in foreign countries.

-Looking at the inward and outward FDI flows in Algeria, it seems that they are more attractive to North African countries than the rest of the world during the period under study from 2011 to 2020.

Algeria must now aim to correct the political, economic and financial conditions to avoid imbalance, and implement serious institutional reforms to take advantage of their economic openness.

Attracting foreign direct investment by providing appropriate determinants and incentives, such as reforming laws and legislation, and the security factor.

The government of Algeria should take steps to diversify its economies in order to reduce exposure to macroeconomic shocks and provide a better environment for foreign investors.

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Appendice n° : 01

	(FDI) millions dollars										
Colonne1	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
ALGERIE	2301.23	2580.626	1499.447	1696.867	1506.733	-584.528	1636.3	1232.342	1466.082	1381.89	
Italy	9178.261	34323.8	92.51003	24279.3	23253.88	19635.12	28468.52	24047.08	32886.23	26569.5	
Spain	39872.51	28379.21	25696.45	28355.41	22600.82	8558.225	31569.4	38806.82	45009.94	12405.5	
France	13890.09	31641.91	16062.05	34279.83	2672.876	45364.69	23077.22	24832.53	38185.1	33964.71	
Belgium	57583.32	83366.35	11670.4	23898	-3505.91	28331.3	59242.66	5159.228	17733.27	9706.923	
Egypt	6385.6	-483	6031	4256	4612	6925.2	8106.8	7408.7	8141.3	9010	
turkey	1468	2331	4107	3534	6682	4809	2954	2622	3607	2841	
Tunisia	74.05337	21.31015	13.44525	21.54297	21.79445	31.09659	241.6167	57.45167	34.00247	21.81	
Morocco	1573.85627	2568.43435	2728.36109	3298.10243	3561.24068	3254.79935	2157.14944	2686.02972	3558.87962	1599.13404	
United State	277779	396569	318196	303432	333014	264359	289261	300378	-90623	124899	
Canada	28400.4426	39669.2979	43111.0061	69368.2412	59005.2048	43835.9699	36055.8742	26521.5272	43459.0398	50331.8906	
Brazil	77686.848	97421.786	82059.83	59089.345	63845.886	49961.367	53700.3837	66584.9274	59802.4065	71989.2702	
China	114734	123985	121073	123911	128502	135577	133711	136315	138305	141225	
Japan	-1251.81	-1758.33	1731.532	2303.718	12029.79	2975.528	19358.84	10977.31	9857.579	14552.38	

Appendice n° : 02

	log(GDP partner)									
Colonne1	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ALGERIE	161207.3	200019.1	209059.1	209755	213810	165979.1	160034.2	167389.9	173757.5	174316
Italy	2134018	2291991	2087077	2141315	2159134	1835899	1875580	1961806	2084882	1994390
Spain	1420722	1478773	1324820	1354757	1369399	1195119	1232076	1312552	1419735	1381685
France	2647972	2867489	2689568	2817631	2859226	2444467	2477754	2599121	2786081	2705603
Belgium	480951.6	522645.5	496181.3	521642.7	534678.1	462149.7	476056.8	504250	543026.3	529306.2
Egypt	214630.4	231100.3	276536.3	270782.5	300949.1	317744.6	270254.5	195135.3	249751.1	319056
turkey	771876.8	832546.3	873981.8	950595.3	934167.8	859794.2	863711.7	852669.2	771355.1	762617.1
Tunisia	44051.14	45811.17	45044.35	46252.26	47633.09	43172.98	41802.05	39813.04	39895.1	38787.77
Morocco	93217.22	101370.8	98265.84	106825.6	110080.8	101179.3	103311.9	109714.3	117921.4	118404.6
United State	15090433	15642934	16298572	16887301	17629704	18328156	18819377	19623674	20681354	21545402
Canada	1617266	1792833	1828686	1847207	1803529	1556127	1530273	1650187	1712562	1733149
Brazil	2208838	2616157	2465228	2472819	2456044	1802212	1795085	2053602	1868613	1813496
China	6087192	7551546	8532186	9570470	10438471	11015562	11137983	12143572	13608152	14227968
Japan	5700098	6157460	6203213	5155717	4850414	4389476	4926667	4859951	4971323	5092694