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An econometric study of foreign direct investment and its impact on certain economic variables related to foreign trade in Algeria from 1985-2022

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Abstract:

This study aims to determine the degree of impact of FDI on some economic variables related to Algeria's foreign trade, GDP, Inflation, and foreign trade expressed in balance of payments balance, for the period 1985 to 2022, Using the ARDL model.

The study found that there was a negative impact of both foreign trade, inflation and GDP on Algeria's foreign direct investment.

Keywords: foreign direct investment, foreign trade, exchange rate, ARDL model.

1. INTRODUCTION

International economy trackers point out that recent developments in the world in the last decade of this century, namely the signing of WTO trade agreements and the liberalization of trade traffic, Internationalization and free flow of private capital and FDI are among the most important factors for deepening economic cooperation, this leads to widespread globalization.

FDI and international trade also play a crucial role in the world economy and promote economic growth, in addition to job creation and technological progress, this type of investment, by which we mean FDI,

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brings many benefits to both investing and receiving countries, For the investing country, FDI provides opportunities to expand markets, access resources and diversify sources of revenue. At the same time, the recipient country is gaining access to new technologies, management experience and capital flows. On the other hand, international trade involves the exchange of goods and services between countries It allows States to specialize in the production of goods in which they have a comparative advantage, resulting in increased efficiency and productivity, enhancing international trade and stimulating innovation and providing consumers with a wide range of goods at competitive prices.

We conclude that FDI and international trade are key drivers of economic development and globalization, provide mutual benefits to participating countries and contribute to the interdependence of the global market.

Problematic:

In light of what has been mentioned, our research problematic can be framed around the main question as follows:

What is the relationship between foreign direct investment and foreign trade variables in Algeria during the period 1985-2022?

Hypotheses:

-The relationship between FDI and foreign trade variables is weak by dropping on Algeria compared to other countries;
-The long-term negative impact of foreign trade on FDI;
-Negative impact of exchange rate on foreign direct investment in the longer term.

Objective of the study:

The study aims to attempt to form an econometric model for the study and analysis of the relationship between foreign direct investment and foreign trade in Algeria during the period 1985-2022 Using the ARDL model.

The adopted methodology: In order to test the hypotheses of the study and achieve its objective, it will rely on the descriptive and analytical methodologies, to determine the relationship between FDI and foreign trade, we will also rely on the inductive approach to the extent to which foreign direct investment affects Algeria's foreign trade variables.

Previous studies:

- Study of Kherouf Mounir & thwamria Rim entitled "**the mutual impact of foreign direct investment and international trade: An econometric study of Algeria's situation 1990-2014**", which aimed at knowing the degree of impact of FDI on international trade, as well as the impact of international trade on foreign direct investment in Algeria's case, Using linear regression models, which concluded that international trade and foreign investment in Algeria had nothing to do with them, the study also noted the need for Algeria to adopt a policy of promoting foreign direct investment.(1)

_study of Bakhit Hassan & Bouzian Mohamed, entitled" **The impact of foreign direct investment flows on foreign trade in the case of Arab States**" which aimed to determine the extent to which foreign investment contributed to Arab States' foreign trade variables (exports, imports), This is by estimating the standard micro-square formula for 1980-2014, One of the most important findings is the impact of foreign direct investment on Arab countries' foreign trade during the period 1980-2014.(2)

- **study of** Mrabet Mohamed, entitled" **The importance of foreign direct investment in the development of foreign trade - a comparative study among some Arab countries"** which aimed to

(1) Kherouf Mounir & thwamria Rim, Mutual Impact of Foreign Direct Investment and International Trade An Econometric Study of Algeria's Situation 1990-2014, Journal of Humanities, vol 2, N°8, December 2018, p p 390-392.

(2) Bakhit hassan & bouzian mohamed, The impact of foreign direct investment flows on foreign trade in the case of Arab States, Academy for Social and Human Studies, N°15, june2017, p p 390-392

assess the impact of promising foreign investment on foreign trade (exports, imports), in some Arab countries using the modified attractiveness model, The results of the estimate show that there is an integral relationship between foreign direct investment and exports in Algeria, Saudi Arabia and the United Arab Emirates, while in Egypt there is an integral relationship between foreign direct investment and imports in the four countries.(1)

I. the theoretical part

In this regard, we will address the concepts of FDI and foreign trade.

1. Conceptual framework for FDI:

Foreign direct investment (FDI) is at the core of the economic development process, a sensitive element and an effective tool for promoting the economy and other areas.

1.1. Definition of FDI: There are many definitions of FDI, the main ones being:

FDI means investments owned and managed by a foreign investor, either because of their full ownership or ownership of a share.(2)

It is also known as that investment made in a host country, but its ownership is foreign and it is for a foreign individual or a non-national company, it is if a foreign direct investment and its variety varies according to the type of foreign direct investment.(3)

Based on the foregoing, a definition of FDI can be given as an investment by an entity or company in another company located in

(1) Mrabet mohamed, The importance of foreign direct investment in the development of foreign trade - a comparative study among some Arab countries, Faculty of Economics, Commercial Sciences and Management Sciences Department of Management Sciences, University of Algiers, Algeria, 2018-2019, p310.

(2) Abd al karim kaki, FDI and international competitiveness, library hassan al asria, Beirut, Lebanon,1STedition, 2013, p16

(3) Soulaimane abd al hadi, Foreign direct investment and environmental rights Islamic and positive economies, alakadimyoun for publication and distribution, Oman, Jordan, 1STedition, 2009, p23.

another country.

1.2. Importance of FDI: The importance of FDI lies in:

-Investment plays a role in increasing national income and contributes to increasing the nation's wealth;

-It plays a role in the introduction of modern technology, which contributes to technological developments;

-Contributing to the creation of positions of employment, in turn contributing to the fight against unemployment;

- Improved balance of payments situation.(1)

2. Theoretical framework for foreign trade:

Foreign trade is the biggest driver of the world economy, and this type of trade has long begun, and the industrial revolution resulting from the dramatic increase in global production, has been the biggest turning point in its history.

2.1. **Definition of foreign trade**: The concept of foreign trade takes two implications first in the narrow sense and the other in the broad sense, and it can be said that foreign trade in the narrow sense that this term covers both visible and unforeseen exports and imports, as to the broad meaning, we mean it:

- visible exports and imports of commodities;
- Invisible service exports and imports;
- International capital movements;
- International migration.(2)

2.2. **Importance of foreign trade**: The importance of foreign trade is:

- Trying to make the level of exports greater than the level
Imports;

(1) Yasser Amer Hameed, Bashar el Iraqi, Estimating and analyzing the impact of competitiveness on foreign direct investment in Arab countries for the period(2009-2018) , Tikrit journal of administrative and economics sciences, vol 18, N° 59 (2022), P508.
(2) Ezzedine Ali, Impact of Foreign Trade on Algeria's Economy 2000-2012, Faculty of Economics, Commercial Sciences and Management Sciences, University of Algiers 03, 2013-2014, Algeria, p 3.

-A key means of exchanging goods and services among States;
-Capital development and increase;
-Try to balance the balance of payments.(1)

3. The relationship between foreign direct investment and foreign trade:

The relationship between FDI and foreign trade is intertwined at both macro and micro levels. FDI policy has an element related to foreign trade. At the same time, trade policy has to have an element specific to FDI, this is aimed at taking advantage of market access opportunities provided by transnational corporations, Trade policies also stimulate FDI in a number of ways, as high tariffs serve the domestic market by FDI rather than exports, and FDI promotion is an alternative to import, or wholly export oriented.(2)

II. Econometric study

All that has been mentioned in the theoretical part will be explained in this section by conducting the econometric study of study variables in Algeria for the period 1985-2022. This will be based on previous studies. The model of this study will be built.

1. Identification of model variables

Table 1. Description of study variables

variables	Description	source
FDI	Dependent variable: FDI in Algeria and our symbol in the FDI study expressed in current US dollar prices	World Bank data
GDP	We used this index as an expression of economic growth and we symbolized it with a GDP expressed in billion to the current prices of Algerian dinars.	World Bank data

(1)Walid abbi, Protection of the environment and liberalization of foreign trade within the framework of the World Trade Organization - Study of Algeria's situation, Faculty of Economic Commercial and Management Sciences, University of Farhat Abbas-Setif 1, 2019-2018, p5.
(2) Haroun al achi, A theoretical study of the nature of the relationship between FDI and foreign trade, Journal of Industrial Economics, issue 6 June,2014, pp38-39

INF	It is one of the most important indicators of internal balance and expresses the stability of prices, Expressed in percentage	World Bank data
UE	The approved exchange rate is the average exchange rate in United States dollars.	World Bank data
FT	Foreign trade: expressed by trade balance. (Exports, imports).	World Bank data

Source: Prepared by the researchers

1.1 Building the study model:

Based on economic theory and previous studies on the subject, taking into account the specificities of the Algerian economy, we have selected the study model as follows:

FDI=F(FT , UE, INF , GDP)

2.Stable study of variables:

In order to test the stability of time series variables, the unit root test was relied upon **ADF (Augment dickeyfuller**), At a morale level of 5% and at the first level and differences for an impartial model and the next table presents the results obtained:

Table2 . Results of unit root tests using the ADF test

variables	**Level**		**First difference**		**integration**
	Constant	**Constant And trend**	**Constant**	**Constant And trend**	
Fdi	-2,55 [0,11]	-2,42 [0,36]	-7,76 [0,000]	-6,31 [0,000]	**I(1)**
Ft	-0,05 [0,94]	-4,39 [0,007]	-4,20 [0,002]	-4,18 [0,013]	**I(1)**
GDP	-0,45 [0,88]	-1,85 [0,65]	-5,3 [0,0001]	-5,26 [0,0007]	**I(1)**
UE	-1,76 [0, 39]	2,00 [0,58]	-5,14 [0,0002]	-4,31 [0,008]	**I(1)**
INF	-1,76 [0,39]	-2,27 [0,43]	-5,72 [0,0001]	-5,66 [0,00]	**I(1)**

Source: Prepared by the researcher based on the outputs of eviews 12

The values between the brackets represent the values of probability (p- value)

3.**Methods of Estimation**

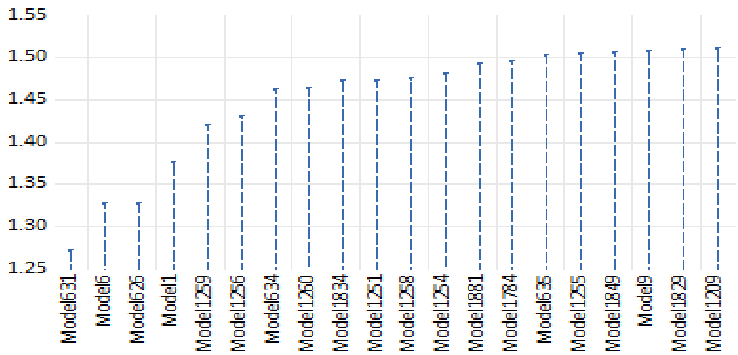
The autoregressive distributed lag (ARDL) is a technique that allows us to simultaneously estimate the short-run and long run dynamics of our model, even when the time-series are stationary I (0) or integrated of order I (1). The variables may include a mixture of stationary and non-stationary time-series for ARDL Bounds testing approach(1)

We note from the table that time series are stable at the first discrepancies, because the probability value is smaller than the statistical connotation. Therefore, the variables are first class integrated, and we conclude that the most appropriate methodology for the study is the ARDL methodology.

4.Determination of the optimal lags and estimation of the ARDL model

Selection of optimal slowing periods in the estimation of the ARDL model: determining the slowing scores of the model, through the form and based on the AIC standard shows that the optimal model is ARDL (3, 4, 4, 3, 4)

Fig.1. AIC graphics values



(1) PESARAN, M. Hashem. The role of economic theory in modelling the long run. The economic journal, 107(440), 1997 , 178-191.

Model	LogL	AIC*	BIC	HQ	Adj. R-sq	Specification
631	2.027585	1.271055	2.314076	1.622000	0.399967	ARDL(3, 4, 4, 3, 4)
6	2.122859	1.325887	2.414256	1.692090	0.337135	ARDL(4, 4, 4, 3, 4)
626	2.119800	1.326073	2.414442	1.692276	0.337012	ARDL(3, 4, 4, 4, 4)
1	2.291720	1.376259	2.509977	1.757721	0.261870	ARDL(4, 4, 4, 4, 4)
1259	-4.416911	1.419207	2.280832	1.709117	0.366609	ARDL(2, 4, 4, 3, 1)
1256	-1.574201	1.428739	2.426411	1.764426	0.321446	ARDL(2, 4, 4, 3, 4)
634	-4.121027	1.461880	2.368855	1.767050	0.330009	ARDL(3, 4, 4, 3, 1)
1260	-6.133035	1.462608	2.278885	1.737261	0.344038	ARDL(2, 4, 4, 3, 0)
1834	-12.273274	1.471108	2.015292	1.654209	0.320222	ARDL(2, 0, 1, 3, 1)
1251	-1.286373	1.471901	2.514922	1.822846	0.266498	ARDL(2, 4, 4, 4, 4)
1258	-4.326002	1.474303	2.381277	1.779472	0.321634	ARDL(2, 4, 4, 3, 2)
1254	-4.416708	1.479800	2.386775	1.784970	0.317895	ARDL(2, 4, 4, 4, 1)
1881	-3.627081	1.492550	2.444873	1.812978	0.295583	ARDL(1, 4, 4, 3, 4)
1784	-10.679932	1.495753	2.130635	1.709372	0.317827	ARDL(2, 0, 3, 3, 1)
635	-5.778658	1.501737	2.363362	1.791648	0.312117	ARDL(3, 4, 4, 3, 0)

Source: Prepared by the researcher based on the outputs of eviews 12

5.ARDL Bounds test estimation results:

Test of cointegration using Test Bounds:

To determine the existence of long run relationship among the variables of the study the Bound test procedure was used. The bound test results were presented in Table 3 below.(1)

Table 3. Results of cointegration test using Test Bounds method

Source: Prepared by the researcher based on the outputs of eviews 12

Bounds test:

ARDL Bounds Test		
Null Hypothesis: No long-run relationships exist		
Test Statistic	**Value**	**K**
F-statistic	4,87	4
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2,2	3,52
5%	2,56	4,01
2,5%	2,86	4,49
1%	3,29	5,06

I (0) and I (1) represent the upper and lower boundaries of critical values, Previous results show a common integration or long-term

(1) Pesaran, M. H., Shin, Y., & Smith, R. JBounds testing approaches to the analysis of level relationships. Journal of applied econometrics. (2001), 289-326.

balance between variables, as F-stat's=4,87 calculated value is greater than the I (1) upper limit of scheduled value at a morale level, 2.5%, 10%, 5%, and so the imposition of nowhere is denied. (H0), alternative imposition H (1) is accepted, which confirms the study's hypothesis that there was a long-term balancing relationship with the model variables in Algeria during the period 1985-2022).

6.long and short run parameters estimation:

6.1 long run parameters estimation:

After confirming the interconnectedness of the model variables through boundary tests, long-term relationships are measured, from which the values of the estimated parameters that reflect long-term parameters of the model are reached.

Fig.2. long run parameters estimation

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFT	-0.081833	0.033896	-2.414200	0.0364
DGDP	-0.038812	0.013151	-2.951300	0.0145
DINF	-0.078371	0.026172	-2.994429	0.0135
DUE	-0.011121	0.016750	-0.663970	0.5217
C	0.437441	0.164684	2.656245	0.0241

EC = DFDI - (-0.0818*DFT -0.0388*DGDP -0.0784*DINF -0.0111*DUE + 0.4374)

Source: Prepared by the researcher based on the outputs of eviews 12

Long-term estimation results indicate, the negative sign of the variables studied is explained by the negative relationship between each variable and Its impact on FDI and vice versa.

From the above findings, we note the negative impact of FT on FDI net flows in the long term, as a 1% increase in foreign trade results in a 0.08% decrease in FDI net flows and we also note that the FT parameter is statistically moral as the value of the corresponding probability of the prob = 0.036, which is less than 0.05 and therefore we reject the zero hypothesis and say that the parameter is moral.

We also note that the negative impact of GDP on net FDI flows in the long term as a 1% increase in GDP results in a 0.03% decrease in net FDI flows and note that the GDP milestone is statistically moral but this result is contrary to economic theory, and this is explained by the nature of foreign direct investment flowing into Algeria. as most of them are geared towards the burning sector, and are therefore not affected by GDP developments.

We note that the negative impact of inflation inf on FDI net flows in the long term as the 1% increase in inflation results in a decrease in net FDI flows by 0.07%. We also note that the inf milestone is statistically moral as the value of the corresponding probability of prob = 0.01, which is less than 0.05, and therefore we reject the zero hypothesis and say that the milestone is noble.

With regard to the UE exchange rate, we note that it has a negative impact on FDI in the long term, as an exchange rate increase of 1% increases net FDI flows by 0.01%. We note that the exchange rate benchmark is not statistically moral, which indicates that the exchange rate's impact on FDI is weak.

6.2 short run parameters estimation:

Fig.3. short run parameters estimation

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DFDI(-1))	0.816504	0.281088	2.904799	0.0157
D(DFDI(-2))	0.375830	0.175500	2.141485	0.0579
D(DFT)	-0.044330	0.023909	-1.854065	0.0934
D(DFT(-1))	0.172579	0.030813	5.600808	0.0002
D(DFT(-2))	0.095337	0.030455	3.130375	0.0107
D(DFT(-3))	0.096407	0.027676	3.483400	0.0059
D(DGDP)	-0.003119	0.008453	-0.368959	0.7199
D(DGDP(-1))	0.079486	0.015724	5.055141	0.0005
D(DGDP(-2))	0.052050	0.012389	4.201346	0.0018
D(DGDP(-3))	0.041343	0.011317	3.653210	0.0044
D(DINF)	-0.030761	0.017705	-1.737382	0.1130
D(DINF(-1))	0.082681	0.020380	4.057032	0.0023
D(DINF(-2))	0.073100	0.015919	4.592015	0.0010
D(DUE)	-0.059712	0.017704	-3.372893	0.0071
D(DUE(-1))	-0.035468	0.016609	-2.135421	0.0585
D(DUE(-2))	-0.021823	0.017776	-1.227666	0.2477
D(DUE(-3))	-0.043572	0.015820	-2.754194	0.0203
CointEq(-1)*	-2.270819	0.342854	-6.623274	0.0001

Source: Prepared by the researcher based on the outputs of eviews 12

The results of the estimation in the short term, confirm that there is a common correlation between the variables of the study in the long-run, because the error correction coefficient, which measures, the speed of return to equilibrium is negative and statistically significant. The error correction coefficient (CointEq = -2.27) indicates short-term imbalances will be corrected by 227% in the long term.

7.Test model quality

Ensure the quality of the model used in the analysis and that there are no normal problems; Several tests were conducted as follows:

Table 4. Diagnostic tests

Test	statistical	Value	probability
Autocorrelation Breush-godfrey	F-Statistic	0,87	0,62
	Ob-squared	21,71	0,47
normal distribution	Jarque-bera	0,13	0,93
Inconsistency ARCH	F-Statistic	0,26	0,61
	Ob-squared	0,27	0,59
Model Stability Ramsey-rest	F-Statistic	0,29	0,77
	t-Statistic	0,08	0,77

Source: Prepared by the researcher based on the outputs of eviews 12

We note that the model does not have an autocorrelation problem, it is naturally distributed, and its change is constant, as well as the absence of errors in the identification of the model at a moral level, LM (BG) statistics indicate that the model is free from the problem of autocorrelation, ARCH statistics also indicate that the nowhere's hypothesis that the random **error** limit in the estimated model is consistently rejected.

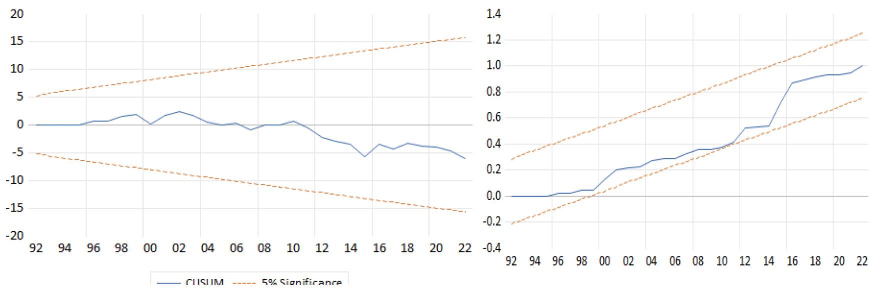
Jarque-bera's statistic indicates acceptance of the hypothesis that errors are naturally distributed in the model, Ramsey-test's statistic indicates the validity of the mathematical form used in the model, which emphasizes the stability of the model.

7.1 Structural stability test for model parameters

Structural stability is tested by a series of tests. The most important of these are the cusum test, which relates to the behaviour of the cumulative total of the parcels, and the cusum of square test, which relates to the behaviour of the cumulative total of the remaining boxes.

These tests show, as shown in the figure, that both the sum of the remains and the sum of their boxes are moving within 5% morale limits, which means that the model is stable on the structural side, which indicates that the previous test results are of quality and accuracy.

Fig.4. Structural Stability Test Results



Source: Prepared by the researcher based on the outputs of eviews 12

CONCLUSION:

Foreign direct investment (FDI) is an important source of financing in all countries, promoting economic growth as well as supporting export power and industrial strategies. Most of this is necessary to provide a good environment for attracting FDI, especially in Algeria, in order to have a positive impact on different variables and on foreign trade at the first level.

The study shows the negative impact of foreign trade at the first level on foreign direct investment.

The study highlighted the following results:

- Foreign direct investment (FDI) is a source of financing, the best source of external financing;
-The results of the study were consistent with the hypothesis that there was a negative impact of foreign trade on long-term FDI;
- There is a negative impact on GDP in the long and short term, which is the opposite of economic theory and is due to the quality of Algeria's economy based on the petroleum economy.

Recommendations:

- The need to take advantage of modern technologies and improve infrastructure, which are of great importance in creating a favourable and attractive investment climate for FDI;
- Take advantage of developed countries' experiences to serve incentive mechanisms for foreign direct investment;
-The need to move out of restricted investments in the petroleum sector and expand the investment circle;
- The need to carry out effective studies on the main determinants of foreign direct investment and foreign trade in Algeria, both in relation to economic and institutional variables.

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