Journal of Contemporary Issues in Business and Government Vol. 29, No. 01, 2023
https://cibgp.com/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2023.29.01.018

The Impact of FDI Flows on the Dimensions of Sustainable Development in Algeria - An Econometric Study During the Period 2000-2021

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Received: 02/2023 **Published: 02/2023**

Abstract:

This study aimed to measure the impact of foreign direct investment on the dimensions of sustainable development in Algeria through an econometric study for the period 2000-2021, and in order to achieve the goal, complete the use of the ARDL program, based on the independent variable that represents the FDI index, and the dependent variables, which represent development indicators. Sustainable based on World Bank data.

Through the analysis, it was found that foreign direct investment negatively affects carbon dioxide emissions in the long and short term, and the flow of foreign direct investment is linked to a positive relationship with GDP in the long and short term, and it was found that there is a significant inverse relationship between foreign direct investment and the unemployment rate in the long and short term, in the previous period in the study sample.

Keywords: FDI, Sustainable development, Carbon dioxide, GDP, Unemployment, Algeria.

List of Abbreviations:

FDI: foreign direct investment

GDP: gross domestic product

1. Introduction:

As a result of the great developments that have occurred in the structure of the global economy, competition has increased between developed and developing countries to attract foreign investments for their active role in supporting the economy, and as a mechanism for establishing and achieving the requirements of sustainable development, through their contribution to raising production rates and economic growth, transferring expertise and modern technology and providing jobs, in addition to achieving economic integration thanks to the competitive advantages they gain, which would motivate countries to make progress in The path of the 2030 Agenda for Sustainable Development, where the attraction of foreign investments is controlled by various economic, political and legal factors that differ from one country to another and similar to countries seeking to achieve sustainable

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2023.29.01.018

development, Algeria has sought to achieve better results under the 2030 Agenda by relying on foreign direct investment, which prompted it to create its investment climate, by taking the necessary measures and granting guarantees, incentives and facilities to attract the largest possible number of investors and benefit them. In this context, the importance and role of foreign direct investment in establishing the dimensions of sustainable development in Algeria has emerged, especially in light of the current developments of intensifying competition, lack of resources and energies, climate changes and other challenges.

Through the foregoing, this research paper came in order to answer the following problem:

To what extent do FDI flows affect the dimensions of sustainable development in Algeria?

To answer the problem of the study, we ask the following sub-questions:

- What is the concept of FDI?
- What is the concept of sustainable development?
- What are the dimensions of sustainable development?
- Is there a relationship between FDI and the dimensions of sustainable development in Algeria?

Hypotheses of the study:

- There is no correlation between the study variables.
- The existence of a positive and significant impact of foreign direct investment on the dimensions of sustainable development in Algeria?
- The existence of a negative and insignificant impact of FDI on the dimensions of sustainable development in Algeria.

Limitations of the study:

- **Time limits:** The study included the available time series on variables during the years from 2000 to 2021.
- **Spatial boundaries:** The study is conducted in Algeria, using data at the quantitative economic level.

Curriculum:

To address this topic, the descriptive approach was used in the theoretical aspect related to the concept of sustainable development and foreign direct investment, as well as the deductive approach (elicitation of results), and the inductive method, which represents statistical data processing and as a tool for observing economic conditions.

2. Previous Studies:

-The Study of **(Bouklia Mouhamed, 2022, the importance of foreign direct investment in Algeria and its impact on its trade balance using the ARDL model**) This study aimed to highlight the importance of foreign direct investment in Algeria and its impact on the trade balance during the period 2003-2018 using the ARDL model . The study concluded that foreign direct investment, GDP and exchange rate have a positive impact on the trade balance, and that economic openness has a negative impact on the trade balance, hence the study recommends the need to diversify exports by attracting foreign direct investment in non-oil sectors to improve the national economy.

-The Study of **(Elhousseyn Yousfi, Benziane Radia, 2020, the impact of foreign direct investment on employment: Empirical Evidence from Algeria)** The study aimed to analyze the impact of foreign direct investment on employment in the Algerian economy, by taking annual data covering the period from 1986-2016, where the study relied on the autoregressive model of distributed time gaps

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(ARDL). And the border test approach, and the findings confirm that there is a significant negative impact of foreign direct investment and the real exchange rate on employment in Algeria, while the impact of GDP has been positive in the long term, as these results represent new visions of Algeria's policy of openness to encourage employment.

-The Study of **(Nessraouin dounia zed, Abdeljalil Djebari, 2022, the impact of foreign direct investment on employment: Empirical Evidence from Algeria)** this study aimed to investigate the impact of foreign direct investment on employment in Algeria in four vital economic sectors during the period 2002-2019. Using the Autoregressive Boundary Test for Distributed Deceleration Intervals (ARDL) With the Statistical Quality Control Test (CUSUM), the study found that there is no statistically significant relationship between FDI and employment in the four sectors in the long term. In the short term, workforce dynamism in all four sectors suggests a positive relationship with FDI.

-The Study of **(Benazza hanaa, Halimi wahiba, 2017, does foreign direct Impact Economic Growth? An Empirical study in Algeria)** The study aimed to highlight the relationship between economic growth and foreign direct investment in Algeria during the period 1990-2015 using statistical methods based on the joint integration test, and the results showed the positive impact of foreign direct investment in Algeria on economic growth in the period under study, and in the last the study recommended the need to stimulate the foreign investor and provide the appropriate environment To activate the foreign investment climate.

3. **Foreign Direct Investment**

Definition of FDI: foreign direct investment involves the transfer of tangible and intangible assets from one country to another to create wealth, which is carried out under the full or partial control of the asset owner. The transfer of tangible property such as equipment under construction, factories and farms also constitutes foreign direct investment. This type of investment is different from portfolio investment, which represents the flow of money through the purchase of shares in a company incorporated or operating in another country. [1]

Definition of the Conference on Trade and Development (UNECTAD): is the investment of non-national foreign funds in fixed capital assets in a particular country, and it is an investment that involves a long-term relationship that reflects the benefit of an investor in another country who has the right to manage and control his assets from his country of origin or from the country of residence, whoever this investor is an individual, company or institution.[2]

We conclude that foreign direct investment is when a foreign investor invests in a country other than his own, called the host country, and has the right to manage the management and decisions of the investment project.

Evolution of FDI flows in Algeria for the period 2000-2021

The reality of foreign direct investment in any country is a reflection of the environment and investment climate prepared in that country, so it was logical to note the increase in the volume and level of foreign direct investment in the regions that prepared the environment to attract the latter, and the decrease in its size and level in less prepared and equipped locations, and compared to neighboring

[1]- M. Sornarajah, The international law on foreign investment, Cambridge university press, UK, 2010, p: 8.
[2]- Unectad, w. (2000). *investment report* . NEW YORK , U.S.A: Unectad,world ,P 267.

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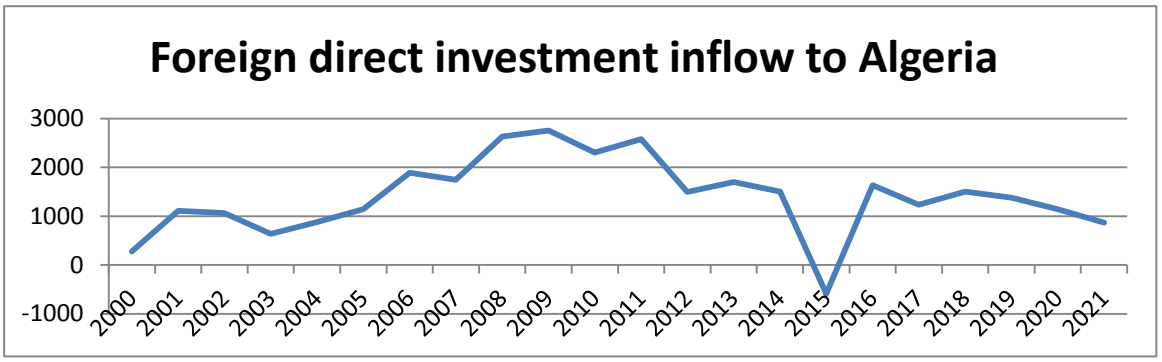
countries, we note that although Algeria has the qualifications and competitive elements to attract investment, Instability from year to year.

The following figure shows Algeria's FDI flows from 2000 to 2021 as follows:

Figure N° (01): Evolution of FDI inflows to Algeria during the period (200-2021)

Unit: Million USD at current prices



Source: Prepared by the authors based on the (UNCTAD) database.

From the figure above, we find that the flow of foreign direct investment developed during the period 2000-2002, as a result of increased investments, especially in the hydrocarbon sector.

Then the value of investments decreased in 2003-2004, amounting to 637.9 and 881.9 million dollars respectively, due to the deterioration of the banking sector in Algeria.

The value of investments returned to a continuous rise from 2005 to 2013. The increase in FDI inflows is due to the positive improvement in macroeconomic indicators.

Then it declined in the years 2014-2015, due to the crisis, where we note that in 2015 the flow of foreign direct investment deteriorated, reaching -584.5 million dollars as a result of the collapse of oil prices, while during the period 2016-2019, FDI flows improved, reaching in 2016 about 1637 million US dollars as a result of economic reforms..

Then the value of investments decreased in 2020-2021, reaching respectively: 1143 and 870 million US dollars, due to the deterioration of economic activity in the wake of the Corona pandemic.

Determinants of FDI

According to the researcher (Ewe-Ghee Lim) that there are several important determinants that can affect all the following types of foreign direct investment:[1]

-Distance and transportation costs: The increasing distance between domestic markets and host markets leads to increased transportation costs, leading to horizontal FDI to replace exports due to high cost, to access foreign markets, the same applies to export-oriented vertical FDI, which can be discouraged due to high transportation costs and the need to ship large volumes of imports and exports of components and finished products.

-Host market size: Large markets are characterized by economies of scale, and the low fixed cost per unit of production helps to reduce the cost of supplying the market, which encourages horizontal FDI, unlike vertical FDI, which is indifferent to the size of the hosting country's market.

-Agglomeration effects: Factors contributing to the agglomeration effect include: the state of the host country's infrastructure, the degree of industrialization, and the size of the current stock of FDI, which have a positive impact on horizontal and vertical FDI.

[1]- Lim Ewe-Ghee. "Determinants of, and the relation between, foreign direct investment and growth: a summary of the recent literature", International Monetary Fund, No. 1-175, (2001),p p 12-13.

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-Factor cost: Reducing production costs stimulates vertical and horizontal FDI, making the net impact of low factor costs positive on FDI.
-Fiscal incentives: Increasing these incentives in the host country compared to competing countries can encourage FDI, especially by reducing production costs.
-Business climate and environment: A favorable business climate reduces the additional costs associated with doing business in host countries, as creating a suitable environment for doing business positively encourages attracting FDI.

4. Sustainable Development

The Interest in the concept of sustainable development emerged in the early eighties in 1981 through the report of the International Union for the Conservation of Natural Resources entitled "Global Strategy for the Conservation of the Environment" Development economists used the term sustainability) in an attempt to clarify the required balance between economic growth on the one hand and environmental conservation on the other.[1]

In 1987, the first official conference on sustainable development was held by the World Commission for Environment and Development, also known as the Brundtland Commission in 1987, which resulted in the issuance of a report entitled "Our Common Future", which defined sustainable development as meeting the needs of the present without abandoning future generations in meeting their needs, as this concept shows the future vision to ensure the continuity of the productivity of natural resources without causing damage to the environment and preserving human rights in real time. and the future"[2] as defined by Todaro and smith . As "a multidimensional process involving significant changes in social structures, attitudes and institutions, as well as economic growth, the reduction of inequality and the eradication of poverty, according to REYES , it is "a social situation within the state in which to meet the needs of its population through the rational and sustainable use of natural resources and systems."[3]

Considering the concept of sustainable development from a global perspective, the latter aims to take into account the environmental and social aspects associated with long-term stakes alongside the economy by striving towards the economic and social well-being of present and future generations and preserving the environment.[4]

Dimensions of sustainable development:

Environmental dimension: This dimension refers to the need to protect the environment, which is represented in the ecosystem that includes vegetation cover and natural resources in general, by taking appropriate decisions and measures that maintain environmental sustainability, as the latter is based on

[1]- Anne . E.Egelston, sustainable development : A history, New York : Edition springer, 2013,p08.
[2]- Maria Lampridi & Charoula Melliou, 2015, the birth and evolution of sustainable devlopment, in giorgos goniadis, Introductoin to sustainable devlopment, international hellenic university, p29.
[3]- Justice Mensah,2019 : sustainable development : Meaning history, principles, pillars and implication for human action: literature review, cogent social, p4.
[4]- H.Lagha, A.Bachi, (2018), sustainable development in Algeria, Algerian Journal of Environmental Science and Technology, vol4, N2, p742.

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2023.29.01.018

the stability of the resource base and achieving a balance in its use while reducing the burden on the environment.[1]

Social dimension: This dimension refers to the development of a socially sustainable society by seeking to achieve a set of goals represented in establishing social justice, individual freedom, equal opportunities among people and achieving stability and social cohesion, which are goals that involve well-being, improving the quality of life of individuals and sustainable human development, thus activating sustainable social development.[2]

Economic dimension: refers to the efficiency of economic and technological activities, and the promotion of investment, productivity, economic growth, and economic potential.[3] The economic dimension of sustainable development is also based on the principle of maximizing the welfare of society and eradicating poverty, through the optimal use of natural resources, and it should be noted here that there is a difference in the concept of sustainable development between developing countries and developed countries, as the latter works to achieve sustainable development by seeking to reduce levels of energy consumption and natural resources, while sustainable development in developing countries means using resources to improve living standards and reduce poverty, which is closely related to environmental degradation and growth. In order to achieve sustainable development according to the economic dimension, it is necessary to stop wasting resources, reduce the dependence of developing countries, reduce income inequality and hold developed countries responsible for pollution by searching for ways to address it.[4]

5. Econometric study of foreign direct investment, net inflows to Algeria for the period 2000-2021:

Description of study variables: In this regard, a group of variables was selected based on theory. Economics and research published on this topic. Where data from World Bank data were used.

Dependent variable: Foreign direct investment, net inflows (balance of payments, current US dollars): FDI

Independent variables:

- Unemployment, total (% of total labour force): UT
- CO2 emissions (kt): ECO2
- gross product: GP

Table N° (01): shows the most important statistical characteristics of the variables studied.

	FDI	UT	ECO2	GP

[1]- Santhana laximi, chndramohan samydoss, 2020, organizatoinal contentoin and confornatoin to sustainable development: a socio-ecocomic perspective, in international bilingual peer reviewed refereed journal, N38, vol10, p70.
[2]- Thilo J. Ketschau,2017, social sustainable development or sustainable social development-two sides of the same coin ? The structure of social justice as a normative basis for the social dimension of sustainability, design & nature and ecodynamics, vol2, No3p339
[3]- Amir Sami, Bey Farid, 2021, Sustainable development in Algeria through some indicators for the period 2008-2018,domaine journal, vol4, N01, p248.
[4]- Naceri Imene, Semed Naouel , The role of green accounting in achieving sustainable development- a case study of Algerian cement enterprise -GICA- economics and sustainable development review, vol 04, N03, 2021, p394.

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Mean	1.36E+09	14.36409	109019.1	1.42E+11
Median	1.37E+09	11.21063	110193.6	1.58E+11
Maximum	2.81E+09	30.93031	196758.7	2.20E+11
Minimum	-6.78TH+08	9.724375	-26757.81	5.44E+10
Std. Dev.	8.24E+08	6.221925	46137.56	5.13E+10
Skewness	-0.388593	1.444790	-0.994980	-0.452286
Kurtosis	3.178893	3.579088	4.329566	2.037389
Jarque-Bera	2.332079	31.84506	21.00152	6.397861
Probability	0.311599	0.000000	0.000028	0.040806
Sum	1.20E+11	1264.040	9593680.	1.25E+13
Sum Sq. Dev.	5.91E+19	3367.974	1.85E+11	2.29E+23
Comments	88	88	88	88

Source: Prepared by researchers based on the results of the "Eviews 10" programme.

The arithmetic mean of the height of (FDI) in Algeria during the study period was 1.36E + 09. It had the highest value recorded at 2.81E + 09 and the lowest value was estimated at -6.78E + 08. We notice small differences in the values of foreign direct investment in Algeria the value of the standard deviation Std. Dev is that the value is somewhat high compared to the dependent variable (UT) and the dependent variable ECO2 and this indicates that there is no homogeneity with respect to the variables.

Time series analysis and standard results

The stability of the time series of the variables studied is tested (in its logarithmic form), which makes it possible to choose the best method of estimating the model.

Time series stability test

We use unit root tests for the time series of the variables used in the model Rely on the Dickie Fuller (ADF) and Philip Peron (PP) tests, where we notice that some strings are stable in their level and some are not stable except when the difference is made on them in the first order. As a result, we are faced with the option of applying the Autoregressive Distributed Time Lapses (ARDL) model. What distinguishes this test is that it does not require the variables studied to be integrated to the same degree, and as "Pesaran" believes, the limit test is in line with the ARDL methodology. It can be applied without taking into account the properties of the time series, whether these variables are stable at their levels (0I) or stable at their first-order differences (I1), or a mixture between the two cases. The only condition for applying this test is that these variables are not stable to second-order differences, and this is presented by the following table:

Table N° (02): UNIT ROOT TEST TABLE (PP)

UNIT ROOT TEST TABLE (PP)

	At Level				
		LOG_UT_	LOG_ECO2_	LOG_FDI_	LOG_GP_
With Constant	t-Statistic	-2.7366	-1.2462	8.0777	-1.7934
	Prob.	***0.0720***	***0.6512***	***1.0000***	***0.3815***
		*	n0	n0	n0

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With Constant & Trend	t-Statistic	-0.9455	-1.7163	8.4952	-1.2410
	Prob.	***0.9454***	***0.7357***	***1.0000***	***0.8952***
		n0	n0	n0	n0
Without Constant & Trend	t-Statistic	-2.0406	-0.9979	-0.8808	1.7280
	Prob.	***0.0402***	***0.2834***	***0.3317***	***0.9791***
		**	n0	n0	n0

At First Difference

		d(LOG_UT_)	d(LOG_ECO2_)	d(LOG_FDI_)	d(LOG_GP_)
With Constant	t-Statistic	-4.7991	-4.2864	2.6927	-4.2735
	Prob.	***0.0001***	***0.0009***	***1.0000***	***0.0009***
		***	***	n0	***
With Constant & Trend	t-Statistic	-5.3119	-4.2393	1.7510	-4.3677
	Prob.	***0.0002***	***0.0060***	***1.0000***	***0.0041***
		***	***	n0	***
Without Constant & Trend	t-Statistic	-4.6148	-4.3101	2.7576	-3.9954
	Prob.	***0.0000***	***0.0000***	***0.9985***	***0.0001***
		***	***	n0	***

UNIT ROOT TEST TABLE (ADF)

At Level

		LOG_UT_	LOG_ECO2_	LOG_FDI_	LOG_GP_
With Constant	t-Statistic	-2.5523	-1.5208	1.1595	-2.6339
	Prob.	***0.1072***	***0.5180***	***0.9977***	***0.0906***
		n0	n0	n0	*
With Constant & Trend	t-Statistic	-1.1906	4.5906	1.5218	-2.0338
	Prob.	***0.9056***	***1.0000***	***1.0000***	***0.5737***
		n0	n0	n0	n0
Without Constant & Trend	t-Statistic	-1.3200	-0.9501	-1.0492	1.3229
	Prob.	***0.1715***	***0.3024***	***0.2633***	***0.9521***
		n0	n0	n0	n0

At First Difference

		d(LOG_UT_)	d(LOG_ECO2_)	d(LOG_FDI_)	d(LOG_GP_)
With Constant	t-Statistic	-2.7928	-0.3485	1.9361	-2.1676
	Prob.	***0.0637***	***0.9118***	***0.9998***	***0.2197***
		*	n0	n0	n0
With Constant & Trend	t-Statistic	-3.2177	-0.6422	1.2355	-2.7223
	Prob.	***0.0886***	***0.9734***	***1.0000***	***0.2308***
		*	n0	n0	n0
Without	t-Statistic	-2.6035	-0.3855	2.1756	-1.7053

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Constant & Trend					
	Prob.	***0.0097***	***0.5422***	***0.9927***	***0.0834***
		***	n0	n0	*

Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant
*MacKinnon (1996) one-sided p-values.

Source: Prepared by researchers based on the results of the "Eviews 10" programme.

Where the calculated values from Student Statistics appeared in the first row in the boxes corresponding to the study variables, while the shaded values indicate the appropriate critical (tabular) values for the ADF and PP models, and these are the same values for all the variables studied, while the values in parentheses indicate the critical probability.

The results of the unit root tests using both the ADF and PP tests revealed that all strings contain the unit root, and from there, the strings are unstable during the study period at the level, and this was confirmed by the PP test, where the absolute values of the estimated statistics were below the critical values at the 5% level. This leads to accepting the null hypothesis, but after taking the first difference, the chains stabilized at the significance level of all 5% for ADF and PP tests. And in this case, it is possible to perform the best cointegration methodology, which is the cointegration methodology using the boundary test under ARDL.

Table N° (03): Pairwise Granger Causality Tests

Pairwise Granger Causality Tests
Date: 12/14/22 Time: 12:07
Sample: 2000Q1 2021Q4
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LOG_ECO2_ does not Granger Cause LOG_FDI_	87	165.728	1.E-21
LOG_FDI_ does not Granger Cause LOG_ECO2_		23.0841	7.E-06
LOG_GP_ does not Granger Cause LOG_FDI_	87	5.06203	0.0271
LOG_FDI_ does not Granger Cause LOG_GP_		7.01557	0.0097
LOG_UT_ does not Granger Cause LOG_FDI_	87	5.33367	0.0234
LOG_FDI_ does not Granger Cause LOG_UT_		0.41781	0.5198
LOG_GP_ does not Granger Cause LOG_ECO2_	87	0.19485	0.6600
LOG_ECO2_ does not Granger Cause LOG_GP_		2.78279	0.0990
LOG_UT_ does not Granger Cause LOG_ECO2_	87	0.46517	0.4971
LOG_ECO2_ does not Granger Cause LOG_UT_		0.83232	0.3642
LOG_UT_ does not Granger Cause LOG_GP_	87	0.94919	0.3327
LOG_GP_ does not Granger Cause LOG_UT_		0.00021	0.9884

Source: Prepared by researchers based on the results of the "Eviews 10" programme.

We retain from the above table the following:

The ECO2 variable does not cause the FDI variable to the 5% significance level.

The GDP variable causes the FDI variable to the 5% significance level.

The UT variable causes the FDI variable to the 5% significance level.

The GDP variable does not result in the ECO2 variable at the 5% significance level.

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The UT variable does not cause the ECO2 variable to the 5% significance level.
The TRQ variable does not cause the GDP variable to the 5% significance level.

Table N° (04): Time series stability test for foreign direct investment, net inflows: FDI

VAR Lag Order Selection Criteria
Endogenous variables: LOG_FDI_
Exogenous variables: C
Date: 12/14/22 Time: 11:32
Sample: 2000Q1 2021Q4
Included observations: 83

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-181.5685	NA	4.765327	4.399242	4.428385	4.410950
1	-36.89501	282.3749	0.149473	0.937229	0.995514	0.960645
2	-17.72515	36.95395*	0.096478	0.499401	0.586829*	0.534525*
3	-16.30974	2.694401	0.095521*	0.489391*	0.605962	0.536223
4	-16.27729	0.060984	0.097781	0.512706	0.658419	0.571245
5	-16.12738	0.278141	0.099815	0.533190	0.708046	0.603437

* 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

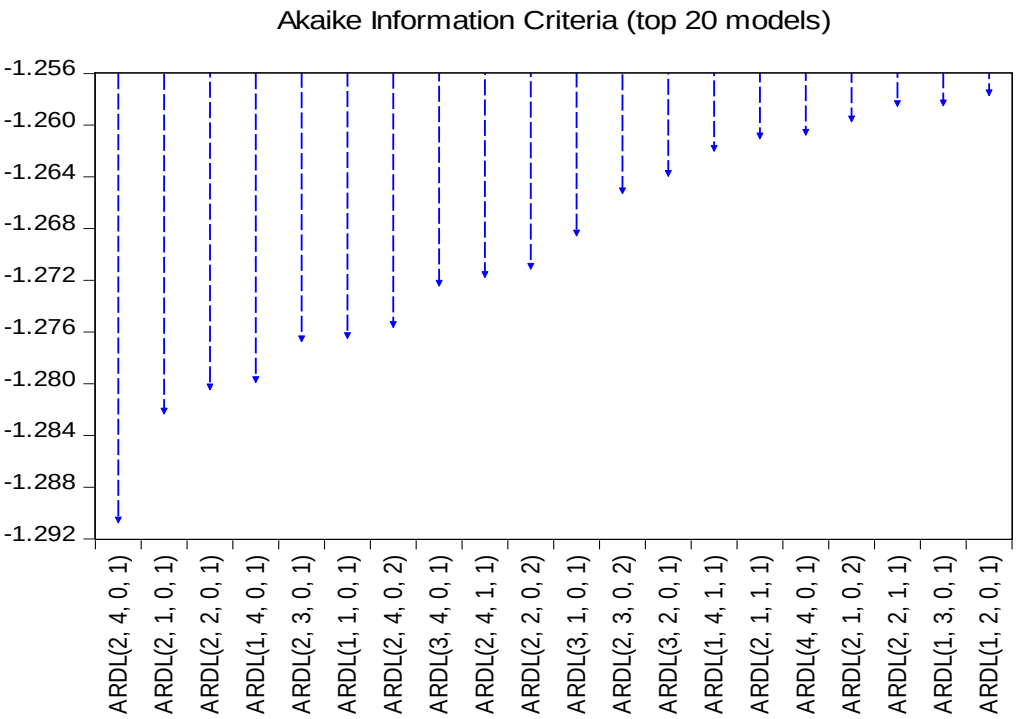
Source: Prepared by researchers based on the results of the "Eviews 10" programme.

According to this test by SC: Schwarz information criterion, it can be seen that the degree of FDI delay is 3.

Cointegration testing using boundary models (ARDL Bonds test)

Determination of the optimal delay: To determine the length of the distributed delays, the Akike calibrator is used. By taking the degree of delay that corresponds to the lowest value of this criterion.

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2023.29.01.018



Source: Prepared by researchers based on the results of the "Eviews 10" programme.

Where we notice through that according to Akaki's criterion, the best model is (2,4,0,1), According to the ARDL methodology, the model is estimated as follows

$$:FDI_t = f(ECO2_t + PBB_t + UT_t)$$

Dependent Variable: LOG_FDI_
Method: ARDL
Date: 12/14/22 Time: 11:40
Sample (adjusted): 2001Q1 2021Q4
Included observations: 84 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LOG_ECO2_ LOG_GP_
LOG_UT_
Fixed regressors: C
Number of models evalulated: 500
Selected Model: ARDL(2, 4, 0, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG_FDI_(-1)	1.314312	0.116937	11.23953	0.0000
LOG_FDI_(-2)	-0.216059	0.134636	-1.604765	0.1129
LOG_ECO2_	-0.487911	0.050927	-9.580596	0.0000
LOG_ECO2_(-1)	0.878624	0.112941	7.779514	0.0000
LOG_ECO2_(-2)	-0.172692	0.120123	-1.437627	0.1548
LOG_ECO2_(-3)	-0.005809	0.079248	-0.073302	0.9418
LOG_ECO2_(-4)	0.114866	0.068470	1.677617	0.0977
LOG_GP_	-0.083049	0.263823	-0.314791	0.7538
LOG_UT_	-3.353420	0.931943	-3.598310	0.0006
LOG_UT_(-1)	3.476715	0.927606	3.748052	0.0004
C	-1.791408	3.288625	-0.544729	0.0076

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R-squared	0.997303	Mean dependent var	8.714286
Adjusted R-squared	0.996934	S.D. dependent var	2.156940
S.E. of regression	0.119437	Akaike info criterion	-1.290505
Sum squared resid	1.041362	Schwarz criterion	-0.972184
Log likelihood	65.20122	Hannan-Quinn criter.	-1.162543
F-statistic	2699.620	Durbin-Watson stat	1.881071
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Prepared by researchers based on the results of the "Eviews 10" programme.

Estimation Command:
==========
ARDL LOG_FDI_ LOG_ECO2_ LOG_GP_ LOG_UT_ @

Estimation Equation:
==========
LOG_FDI_ = C(1)*LOG_FDI_(-1) + C(2)*LOG_FDI_(-2) + C(3)*LOG_ECO2_ + C(4)*LOG_ECO2_(-1) + C(5)*LOG_ECO2_(-2) + C(6)*LOG_ECO2_(-3) + C(7)*LOG_ECO2_(-4) + C(8)*LOG_GP_ + C(9)*LOG_UT_ + C(10)*LOG_UT_(-1) + C(11)

Substituted Coefficients:
==========
LOG_FDI_ = 1.31431202064*LOG_FDI_(-1) - 0.216058878622*LOG_FDI_(-2) - 0.487910976547*LOG_ECO2_ + 0.878623906387*LOG_ECO2_(-1) - 0.172691585516*LOG_ECO2_(-2) - 0.00580899526709*LOG_ECO2_(-3) + 0.114865924121*LOG_ECO2_(-4) - 0.083049018652*LOG_GP_ - 3.35341954916*LOG_UT_ + 3.47671542646*LOG_UT_(-1) - 1.79140781446

Cointegrating Equation:
D(LOG_FDI_) = -1.791407814543 + 0.098253142018*LOG_FDI_(-1) + 0.327078273177*LOG_ECO2_(-1) - 0.083049018645*LOG_GP_** + 0.123295877313*LOG_UT_(-1) + 0.216058878623*D(LOG_FDI_(-1)) - 0.487910976547*D(LOG_ECO2_) + 0.063634656663*D(LOG_ECO2_(-1)) -0.109056928854*D(LOG_ECO2_(-2)) - 0.114865924121*(LOG_FDI_ - (-3.32893449*LOG_ECO2_(-1) + 0.84525560*LOG_GP_(-1) -1.25487974*LOG_UT_(-1) + 18.23257534) -3.353419549140*D(LOG_UT_))

Through these results, we notice that the coefficient of determination is equal to 99%, which means that the independent variables explained the changes that occur at the level of FDI of 99%. And the rest is due to other factors, including standard error, which indicates that the model has a strong explanatory power, in addition to the value calculated for the test Fisher is equal to 2699.620, which is higher than the tabular values, which means that the model as a whole has significant significance.

Table N° (05): ARDL Error Correction Regression

ARDL Error Correction Regression
Dependent Variable: D(LOG_FDI_)
Selected Model: ARDL(2, 4, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 12/14/22 Time: 13:12
Sample: 2000Q1 2021Q4
Included observations: 84

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.

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D(LOG_FDI_(-1))	0.216059	0.123196	1.753780	0.0837
D(LOG_ECO2_)	-0.487911	0.046865	-10.41088	0.0000
D(LOG_ECO2_(-1))	0.063635	0.109389	0.581729	0.5625
D(LOG_ECO2_(-2))	-0.109057	0.050671	-2.152235	0.0347
D(LOG_ECO2_(-3))	-0.114866	0.050347	-2.281496	0.0254
D(LOG_UT_)	-3.353420	0.821459	-4.082271	0.0001
CointEq(-1)*	-0.098253	0.013279	7.399244	0.0000

R-squared	0.976635	Mean dependent var	-0.168162
Adjusted R-squared	0.974814	S.D. dependent var	0.732790
S.E. of regression	0.116294	Akaike info criterion	-1.385743
Sum squared resid	1.041362	Schwarz criterion	-1.183175
Log likelihood	65.20122	Hannan-Quinn criter.	-1.304313
Durbin-Watson stat	1.881071		

* p-value incompatible with t-Bounds distribution.
F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	10.38094	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Through the estimation results of the unconstrained error correction model presented in table N°: a parameter appears that the correction of the error (CointEq (-1) = -0.098253) is a negative and significant sign, which indicates accuracy and precision.

The long-run equilibrium relationship and the error correction mechanism are present in the model, which means that 09.82% of short-term errors can be corrected in one unit of time (one year) in order to return to long-term equilibrium status.
After determining the results of the limit tests for the models, as shown in Table No.: the Fisher f-stat statistical value for the models was estimated to be 10.38094, which exceeds the upper significance limits of 1% set by pissaran, up to the value of 10%, leading to the rejection of the null hypothesis. The assertion that there is no long-run relationship by switching from explanatory variables to dependent variables and accepting the alternative hypothesis, which states that there is a long-run relationship, and this can be done by choosing the cointegration of the long-run equilibrium relationship for all models

Bounds test method

To detect the existence of a long-term relationship between the variables, the bound test should be used, comparing the calculated value of F for the coefficients of the slowed down independent variables with the value of the critical F-statistic. The test is based on the null hypothesis, which states that there is no long-term equilibrium relationship between the variables.

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Table N° (06): ARDL Long Run Form and Bounds Test

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LOG_FDI_)
Selected Model: ARDL(2, 4, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 12/14/22 Time: 12:05
Sample: 2000Q1 2021Q4
Included observations: 84

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.791408	3.288625	-0.544729	0.0076
LOG_FDI_(-1)*	0.098253	0.032777	2.997649	0.0037
LOG_ECO2_(-1)	-0.327078	0.053085	6.161389	0.0004
LOG_GP_**	0.083049	0.263823	-0.314791	0.0038
LOG_UT_(-1)	-0.123296	0.327662	0.376290	0.0778
D(LOG_FDI_(-1))	0.216059	0.134636	1.604765	0.1129
D(LOG_ECO2_)	-0.487911	0.050927	-9.580596	0.0000
D(LOG_ECO2_(-1))	0.063635	0.116081	0.548191	0.5852
D(LOG_ECO2_(-2))	-0.109057	0.064925	-1.679747	0.0973
D(LOG_ECO2_(-3))	-0.114866	0.068470	-1.677617	0.0977
D(LOG_UT_)	-3.353420	0.931943	-3.598310	0.0006

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG_ECO2_	-3.328934	1.247852	-2.667732	0.0094
LOG_GP_	0.845256	2.708756	0.312046	0.0559
LOG_UT_	-1.254880	3.317339	-0.378279	0.0063
C	18.23258	33.23837	0.548540	0.5850

EC = LOG_FDI_ - (-3.3289*LOG_ECO2_ + 0.8453*LOG_GP_ -1.2549

Source: Prepared by researchers based on the results of the "Eviews 10" programme.

EC = LOG_FDI_ - (-3.3289*LOG_ECO2_ + 0.8453*LOG_GP_ (-1.2549)*LOG_UT_ + 18.2326)

The test is based on the null hypothesis, which states that there is no long-term equilibrium relationship between the variables.

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We notice in the table above that the value of γ: FDI was Positive (0.098253) and significant with an estimated value of (0.0000), which is less than 0.05. This indicates that the long-term model corrects short-term model errors in less than a year.

Analyze the results of the long-term estimate

It is clear from the bottom of the table that:

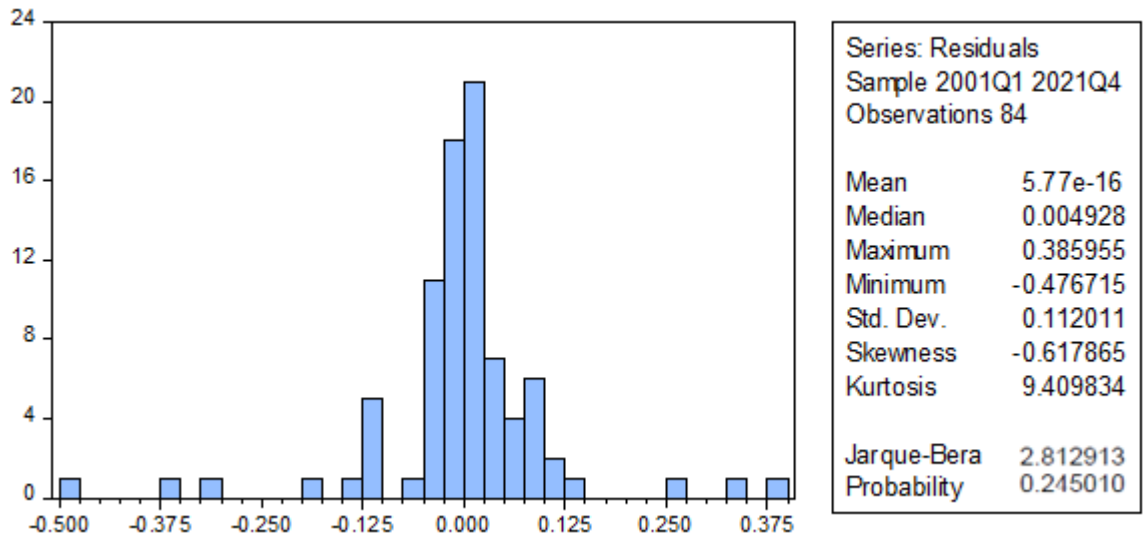
- The ECO2 variable negatively affected the T:EDI dependent variable in the long run and is highly significant and acceptable at 0.94% (0.0094), or less than 5%, because a 1% increase leads to a decrease in FDI of 3.32%.
- The variable GDP, had a positive effect on the dependent variable T: EDI in the long run and has an acceptable significance at 7.75% (0.0775), or less than 10%, where an increase of 10% leads to an increase in OP of 0.84%.
- The UT variable negatively affected the T: EDI dependent variable in the long run and is highly significant and acceptable at 0.63% (0.0063), or less than 5%, because a 5% increase results in a 1.25% decrease in FDI.

Analyze the results of the short-term estimate

- The ECO2 variable negatively affected the T:EDI dependent variable in the short term and is highly significant and acceptable at 0.04% (0.0004), or less than 5%, because a 1% increase leads to a decrease in FDI of (0.327078)%.
- The variable GDP had a positive effect on the dependent variable T: EDI in the short term and an acceptable significance at 0.38% (0.0038), or less than 10%, where an increase of 5% leads to an increase in OP of 0.84%.
- The UT variable negatively affected the T: EDI dependent variable in the short run and is highly significant and acceptable at 7.78% (0.0778), or less than 5%, because a 10% increase results in a decrease in FDI of 0.123%.

Statistically evaluate the model

Figure N°: Results of the Normal Residue Distribution Verification Test



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From the figure above, it is clear that the residuals follow a normal distribution, because the J-B statistic, which has a value of 2.812913, is completely lower than the critical value for the distribution of $\chi^2_{2(0.05)}$, in addition the corresponding probability is greater than 0.05, which means that the hypothesis is rejected.

Residue autocorrelation test: In order to detect the autocorrelation of residues, we rely on a - Breusch-Godfrey LM test

Table N°(07): Autocorrelation Test Results (LM Test)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.744083	Prob. F(1,72)	0.3912
Obs*R-squared	0.859217	Prob. Chi-Square(1)	0.3540

Note that the value of the Fisher statistic (F-statistic = 0.744083) at the significance level (P.value = 0.3912), which is greater than a significant level of 5%, and consequently the null hypothesis is accepted that the model is devoid of the residual autocorrelation problem. Error variance inconsistency test: use of the autoregressive test conditional on the stability of variance - (ARCH)Where the null hypothesis indicates that the variance of the residuals is constant and the alternative hypothesis indicates that the variance of the residuals is,The results obtained were as shown in Table N°07:

Heteroskedasticity Test: ARCH

F-statistic	1,911867	Prob. F(1,81)	0,17119
Obs*R-squared	36.83467	Prob. Chi-Square(1)	0.0000

Where we notice that the value of Fisher's statistic (F-statistic = 1.91) has reached a significance level (P.value = 0.17119). It is above the significance level of 5%, and therefore the null hypothesis is accepted with the stability of the residual variance.

Model stability test: The structural stability of the estimated coefficients is verified if the graph of each falls -From the cumulative sum of residuals and the cumulative sum of squares test of the reciprocal remainder test in a critical boundary region at a significant level of 5% (Jonas Kibala Kuma, 2018: 14-15), and the results of these two, The two tests are illustrated in Figure N°:

Figure: CUSUM squares and CUSUM test results

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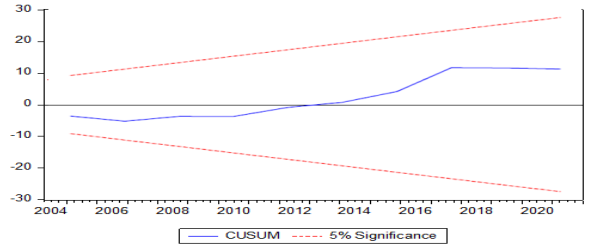

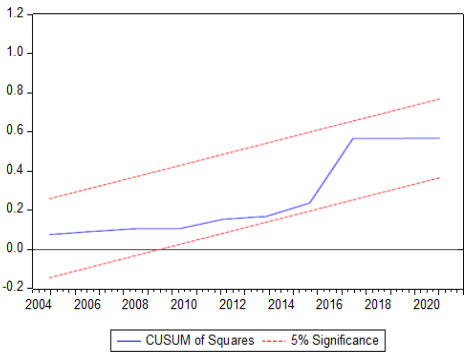

From the figure above, we notice that the graph of the two tests is located between the two lines of the critical limits at a significant level of 5%, which indicates that there is good stability and harmony in the model, that is, there is stability between the results of the long-term and short-term results.

6. Conclusion

The study aimed to measure the impact of foreign direct investment on the dimensions of sustainable development in Algeria during the period: (2000-2021), and to answer the problem posed, it was based on the steps of the standard study, according to the **ARDL** program.

Algeria has paid attention to the flow of foreign direct investment because it leads to the benefit of the host country and maximizes its gains, and it also has several positive effects on aspects of sustainable development, as it eliminates unemployment and increases the employment rate, as well as works to increase growth and economic development, as well as works to bring modern technology that reduces the emission of polluting gases to the environment.

The results of the study:

- It indicates that there is a negative (adverse) and significant impact of FDI on the amount of carbon dioxide emissions in the long and short term, which means that increased FDI will lead to a decrease in the amount of carbon dioxide emissions.

FDI has successfully proven its impact on carbon dioxide emissions, and its impact has been negative, due to the introduction of modern technology. FDI is also helping host countries increase their production thanks to the new technology associated with it, which is non-polluting.

Perhaps the most prominent positive role played by the technology associated with foreign direct investment in preserving the environment is the recycling of waste and its exploitation either in the manufacture of other useful materials, or in the production of energy..

The recent rise in global interest in climate change has led to the development of new ecological technology aimed at helping to solve some of the biggest environmental concerns we face as a society through a shift towards a more sustainable and low-carbon economy, environmental technology is also known as "green" or "clean" technology and refers to the development of new technologies aimed at maintaining, monitoring or reducing the negative impact of technology on the environment and resource consumption.

- The flow of foreign direct investment is associated with a significant positive relationship with GDP, both in the long and short term as this relationship can be explained by the diversity of sectors that attract foreign investment flows.

The influx of foreign direct investment contributes to increasing economic growth and promoting economic development by improving infrastructure, creating job opportunities, spreading and localizing modern technology, providing appropriate resources to finance investments, expanding the

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2023.29.01.018

investment base in the host country, as well as identifying modern methods of management, organization, communication and marketing, which leads to the acquisition of national labor with higher skill and experience.

An increase in FDI flows to the host State also increases the host State's exports, thereby stimulating economic growth.

- The existence of a significant inverse relationship between foreign direct investment and the unemployment rate in the long and short term, as the phenomenon of unemployment has emerged as a global problem and an issue with economic, social and even political dimensions, and it is increasing year after year due to the steady population increase, and countries have become in front of the inevitability of providing job opportunities to reduce unemployment and the serious consequences resulting from it. Supreme.

Recommendations:

- ✓ Modernizing laws and legislation in Algeria and making them enjoy some stability by supporting trust with foreign investors.
- ✓ The need to develop the necessary infrastructure for investment and support the ICT sector in order to gain investor confidence.
- ✓ Developing and training the human resource to increase competencies.
- ✓ Carrying out economic reforms, especially at the macro level.
- ✓ Benefiting from successful international experiences in attracting foreign capital.

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