

The Role of Manufacturing Industries in Achieving Economic Development

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Abstract:

This study explores the role of the manufacturing sector in promoting economic development in Algeria from 1991 to 2023.

Using the ARDL methodology, it examines both short- and long-term relationships between GDP and key macroeconomic indicators, including trade openness, foreign direct investment inflows, inflation, and industrial employment, based on World Bank data.

The findings indicate that these variables have had an insignificant impact on GDP growth, reflecting persistent dependence on the rent-based economy and the weak performance of the manufacturing sector.

The study recommends reorienting industrial policies toward diversified, value-added activities to achieve sustainable economic growth.

Keywords: Manufacturing industry, Economic development, Algerian economy, ARDL model.

Jel Classification Codes : C320, O11, O14, O55, L60.

1. INTRODUCTION

After the nineteenth century and the economic, social and political changes brought about by the Industrial Revolution, some countries achieved remarkable progress, while developing countries, dominated by underdevelopment, sought to achieve progress by finding strategies that support economic development.

Economic development aims to expand the scope of productive capacity, with the necessity of paying attention to agriculture, as well as industry, because progress in the industrial field helps to increase productive capacity on its own.

Industry is one of the most important sectors, forming a crucial starting point for effective development across numerous fields. It serves as a resource for and complement to many other sectors, particularly agriculture, with which it works in parallel due to its impact on meeting both local and global demand. The industrial sector is generally divided into two types: the manufacturing branch extractive industries and the manufacturing sector, the latter being the most important branch, so every country seeks to develop this sensitive sector, especially in recent times.

Algeria, like other countries, is trying to pursue this path in order to develop the industrial sector in general and the manufacturing sector in particular, due to the costs it bears for importing industrial products with widespread consumption, which negatively impacts the state treasury through the outflow of hard currency, especially in light of the structural financial imbalances that the national economy is experiencing on the one hand, on the other hand, it is an attempt to get rid of oil dependency, and thus the manufacturing sector is a pivotal element in achieving development, by supporting economic growth and contributing to combating unemployment, as well as improving the trade balance by reducing imports, while enhancing local added value.

This research paper will attempt to shed light on the manufacturing industries in Algeria and their role in achieving economic development.

Therefore, we pose the following question: **"What is the role of the manufacturing industries in achieving economic development in Algeria?"**

2. The Nature of Economic Development and Manufacturing Industries

In this section, we will explore the concepts of economic development and manufacturing industries:

2.1 The nature of economic development:

The world is struggling to find a solution to reduce the economic and technological gap between developing and developed countries, which has been exacerbated by underdevelopment, weak agricultural and industrial infrastructure, as well as economic dependence on foreign countries...and other factors, whether economic or non-economic.

Thus, economic development has become a crucial means of reducing the gap.

2.1.1 The Concept of Economic Development:

Economic development can be defined as the process of lifting the national economy from its state of underdevelopment and moving it towards progress.

This is achieved by increasing the annual national output through the development of society's productive forces, thereby raising the annual income level to the point necessary to provide a better standard of living, commensurate with the

modern era, whether in terms of by satisfying his material and moral needs of all kinds (Al- Rifi, 2015).

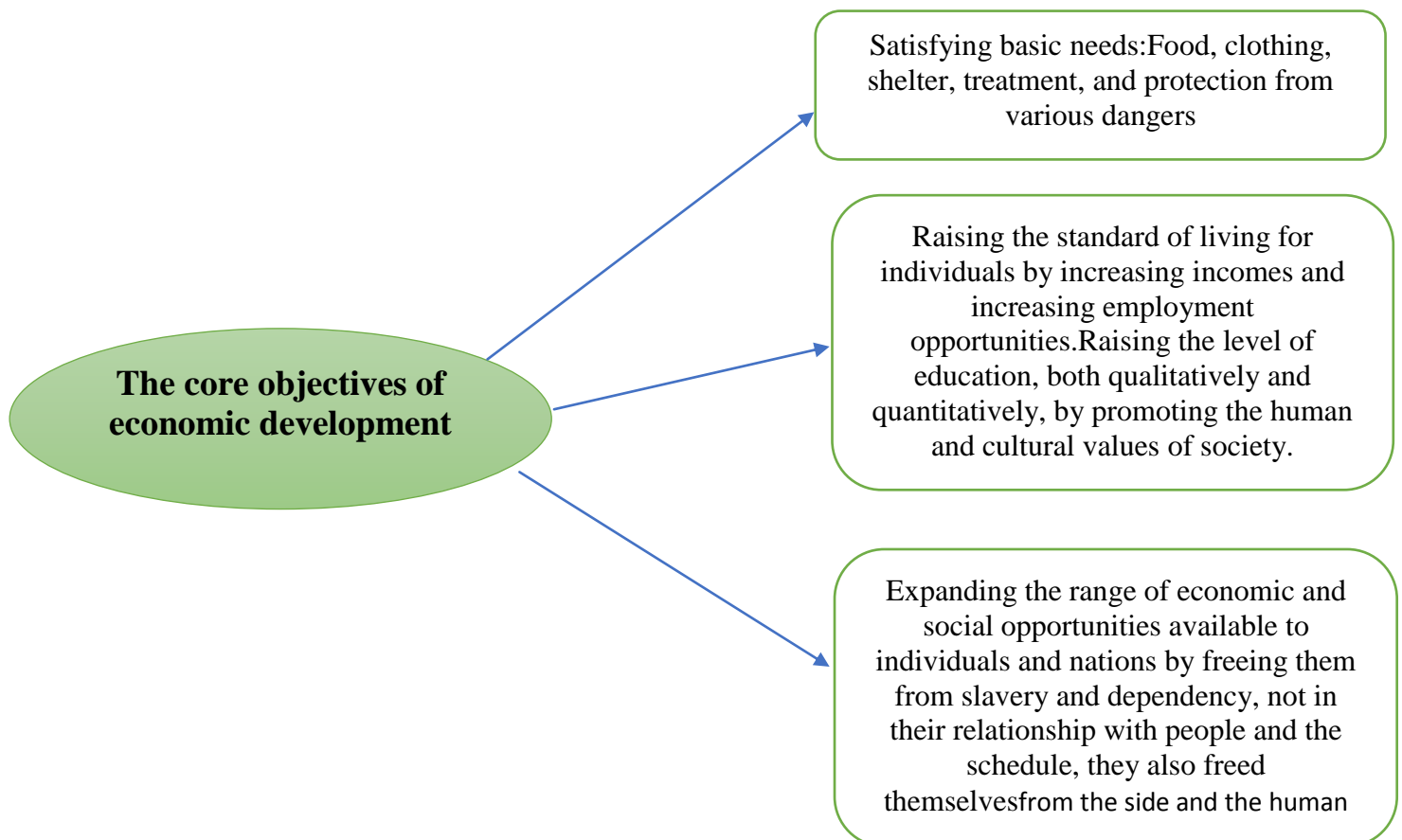
Economic development is also defined as achieving a continuous increase in real national income and an increase in average per capita income, as well as making numerous changes in the structure of production, that is, changing the structure of income distribution in favor of the poor (Ajmiya, 2010).

From the above, it can be said that economic development is a real increase in output over a certain period of time, to raise the standard of living, and to get out of a state of underdevelopment.

2.1.2 Economic Development Goals:

Economic development aims to achieve three key objectives, which are considered the core of development. The following figure illustrates this:

Fig.1.Economic Development Goals



Source: Hamdani, Mahieddine 2008 - 2009, p 16.

2.1.3 Requirements for Economic Development:

These consist of a set of requirements and elements that must be considered in order to achieve effective economic development, as follows:

- **Capital accumulation:** All economists emphasize the crucial importance of capital accumulation in achieving development. Capital accumulation is achieved through

the investment process, which requires a sufficient level of real savings. These savings are then used to provide resources for investment purposes, rather than directing them towards consumption. This is the essence of capital accumulation the fact is that such accumulation enhances a country's capacity to produce goods, and can achieve a high rate of growth.

- **Natural resources:** Natural resources are defined as all the original elements that make up the Earth. Accordingly, the United Nations defines natural resources as anything found by humans in their natural environment, which they may utilize for their benefit. These resources include rocks that contain mineral ores, energy sources and other useful products. These natural resources are of particular importance in the stage of economic growth, because the start of the capital formation process necessarily requires that the country be in a position to produce a surplus.
- **Human resources:** This refers to the capabilities, talents, skills, and knowledge of individuals that can or should be used in producing goods or providing useful services. Therefore, human resources play a vital role in the development process. Economically, this stems from the fact that human beings are both the goal and the means of development. Since human beings are the goal of development, its ultimate aim is to raise the standard of living by increasing real income and improving other aspects of human life. This is achieved by increasing and developing production and ensuring its fair distribution. As for the fact that man is the means of development, it comes from the fact that the development process is clarified, implemented and bears fruit through human activity, and that it is impossible to imagine development occurring without relying on man as its designer and implementer.
- **Technology:** Technology is defined as any organized knowledge based on experience or practical theory that enhances society's ability to produce goods and services, as it contributes to increased production when it is embodied in humans and takes the form of improved skills for work and management (Boujelal, 2022).

2.1.4 Methods of Economic Development:

There are several methods for promoting economic development, the most prominent of which are:

- Providing adequate and necessary capital for development, both material and human.
- Educational systems that prepare the workforce.
- Developing workforce planning mechanisms, as well as selection and recruitment mechanisms.
- Creating a system of incentives and rewards, and providing a suitable economic and administrative environment.
- Preparing and qualifying the workforce in various specializations and skills, in addition to developing competencies.
- Equipping the workforce with the necessary knowledge, experience, and skills to achieve development goals in all fields.
- Simplifying procedures and reducing bureaucracy.

- Allocating study days for scientific research and providing the appropriate environment, as well as the appropriate climate that contributes to solving economic development problems (Boudayef, 2016).

2.1.5 Indicators for Measuring Economic Development:

Among the most commonly used indicators for measuring the level of economic development achieved in one country compared to another are:

- Population size.
- Average real per capita income.
- Average per capita income adjusted for purchasing power parity.
- Human development indicators such as health and education (Al-Nabbati, 2015).

2.2 The Nature of Manufacturing Industries:

Industry is a crucial starting point for effective development across various sectors. It is one of the most important sectors, serving as a resource and complement to many other sectors, particularly agriculture, with which it operates in parallel. This is due to its impact on meeting local and, consequently, global demand. The following section will focus on the manufacturing industries branch:

2.2.1 The Concept of Manufacturing Industries:

Manufacturing industries can be defined as one of the most important productive activities upon which a country relies, occupying a central position in the economies of modern countries, and an indispensable driver in the process of economic and political progress (Nashour, 2022).

According to the United Nations, manufacturing is the mechanical transformation of inorganic or organic materials into new materials using manual or mechanical means, whether practiced in homes or factories. Therefore, it can be said the manufacturing industries in general have been keen to respond to all human needs, which are increasing over time, by providing consumer or secondary goods that are used as raw materials in the manufacturing industries (Deraji, 2018).

The International Standard Industrial Classification (ISIC) of Industrial Activities is one of the most widely used classifications in international statistics. Developed by the United Nations Statistical Office, this classification divides industry into three main groups:

- Mining and quarrying.
- Manufacturing.
- Electricity and water.

According to this classification, manufacturing industries were divided into several sections, which formed nine main branches:

- Food, beverage, and tobacco manufacturing.
- Textile, clothing, and leather manufacturing.
- Wood and wood products manufacturing, including furniture.
- Paper, paper products, and printing manufacturing printing and publishing.
- Manufacturing chemicals and chemical products from petroleum and coal, and rubber and plastic products.
- Manufacturing products from non-metallic mineral raw materials (excluding petroleum and coal).

- Manufacturing of basic metal products.
- Manufacturing of fabricated metal products, machinery, and equipment.
- Other manufacturing industries (Ben Moussa, 2018).

Manufacturing industries are divided into investment industries and consumer industries:

- **Investment industries:** These are industries that produce intermediate goods necessary for the production of other goods, as well as capital goods, such as: food industries, chemical industries, spinning and weaving, leather industries...etc., and they require relatively large capital.
- **Consumer industries:** These are industries that work to transform raw and primary materials into goods ready for use. They are started as a result of the increase in demand for consumer goods, and they produce for the end consumer, such as: textile industries (Yaakouben, /).

2.2.2 The Importance of Manufacturing Industries:

The role and importance of manufacturing industries lie in the following points:

- **Building the national economy:** When a country has more developed manufacturing industries, its economy is stronger, and therefore its export capacity is large, which is reflected in its national economy.
- **Providing job opportunities:** Manufacturing industries help to provide many job opportunities, especially in countries that suffer from the problem of unemployment, such as most Arab countries, since, despite their reliance on machines, they are in constant need of manpower in order to complete manual work and manage the machines.
- **Achieving progress and growth:** Manufacturing industries lead to progress and growth, especially in small areas. The progress of cities is mainly due to their reliance on industry, which later produces trade. When manufacturing industries develop, they help to achieve progress and advancement for countries.
- **Achieving development and integration:** Manufacturing industries contribute to the economic development of most countries worldwide. We can now produce goods at lower prices than before, which significantly contributes to development based on providing goods to the largest possible segment of the population. The existence of an industrial sector that produces the majority of consumer, intermediate, and production goods will help to building the material foundation of the national economy, through the development of the other branches and activities of the national economy.
- **Strengthening economic independence:** Countries that do not possess manufacturing industries do not yet have economic independence. This is the reality for all developing countries, as manufacturing industries contribute significantly to reducing reliance on imports from other countries, especially for strategic goods that are indispensable, such as food products. The existence of a mature manufacturing sector is essential an integrated system will work to enhance economic independence, reduce import rates of manufactured goods of all kinds, and this will pave the way for reducing rates of commercial and technological dependence on advanced industrial countries.

➤ **Capital increase:** The industrial sector plays a crucial role in the process of capital accumulation, as it constitutes the productive sector that consumes the largest share of the output generated by other sectors.

This intersectoral linkage contributes significantly to stimulating investment accumulation within the national economy, enhancing the level of employment, and expanding the stock of capital.

Moreover, the manufacturing sector serves as a key driver of sustainable economic growth, given its capacity to absorb investments and transform them into productive assets that strengthen the overall economic structure.

In addition, the industrial sector is considered a major catalyst in the investment process, as it relies heavily on the products of other industries-particularly intermediate goods-as essential inputs in production.

It also employs modern technologies and advanced production methods that stimulate investment activity and increase productivity levels across the economy (saliha, 2020).

In general, it can be stated that the presence of a well-developed manufacturing sector within a country contributes significantly to building a strong and resilient economy, which in turn leads to the creation of new employment opportunities.

2.2.3 Requirements for Developing Manufacturing Industries:

The growth of manufacturing industries depends on fulfilling a set of requirements, which stimulates them to grow and develop in the best possible ways. Some of the most important examples include on it we find

➤ **Raw materials and energy:** The basic principle for carrying out the work of manufacturing industries is the use of raw materials and their transformation into another form. Therefore, achieving growth for these industries depends on making the best use of all forms of available resources.

➤ **Qualified human resources:** Qualified human resources must be provided to develop the manufacturing industry because human components are of great importance in the application of manufacturing processes. The use of modern machines and equipment is not a reason to abandon human resources, but rather their operation depends on the need for workers trained to deal with them, so that the benefits resulting from their presence in the industrial work environment can be achieved.

➤ **Market demand size:** This is another requirement for the growth of manufacturing industries, as it is the means used to measure the size of a specific manufacturing industry. It also contributes to determining the size of the market in which this industry will be located, and this helps to know the quantity of supply of manufacturing industry products, which helps to determine the size of the production elements that help to implement this industry.

➤ **Capital:** It is one of the requirements used in the growth of manufacturing industries, as it contributes to establishing the main base for building any type of manufacturing industry. It also helps to develop and increase the size of existing manufacturing industries. It is possible to provide capital through financial savings (Deraji, 2018).

2.2.2 Challenges of Industrialization in Developing Countries:

The industrialization process in developing countries faces a number of challenges that hinder its effectiveness and desired efficiency, as follows:

- **National challenges:** These include meeting the demands of the local market and the aspirations for comprehensive industrial development. As such, they are dependent on adopted government policies, especially since they are emerging industries requiring financial, regulatory, administrative, and legal support. The greatest threat to their survival is the lack of necessary funding and continuous.
- **Internal challenges:** These are specifically related to achieving horizontal and vertical integration to provide a strong impetus for subsequent stages of the development process. Industrial development and growth occurring at the level of specific units without impacting the growth of other industries and sectors may render that growth, and consequently the industry itself, temporary and quickly disappear once its underlying causes are gone.
- **Internal challenges:** These are related to the development of the industry's creative and technical capabilities, to move from a stage of small size and limited goals and horizons to a stage of maturity and strategic planning. Therefore, it must undertake a modernization process and develop its existing capabilities.

Whether it is related to increased spending on research and development, or attracting advanced technology, in this regard it faces the challenge of choosing the type of technology, because the developed world is moving from harmful technology to clean technology, and the latter is very expensive, and many developing countries may be unable to obtain it.

- **Regional challenges:** These are primarily linked to the conditions of global competition imposed by multinational corporations, which are characterized by advanced production and management efficiency, high quality, and low prices. These factors affect small and medium-sized local industries established under specific circumstances. Furthermore, global economic liberalization under the World Trade Organization also contributes to these challenges removing government protection from those industries will lead to their demise, or at least cause an imbalance in their budgets and expose them to crisis.
- **The challenge of trying to catch up with advanced industrial countries:** It is difficult for developing countries to catch up with advanced countries, which have been undergoing a structural industrial transformation for decades, as they are no longer only concerned with the material capitalist production of advanced equipment and machinery, but have turned to specializing in the production of information and the knowledge industry, in order to ensure their monopoly not only with regard to developing countries even the major industrial countries have come a long way, while the rest of the developing countries are still looking to achieve self-sufficiency in durable goods (Saoud, 2017).

3.Economic Study:

Within the framework of modern standard models, the Autoregressive Distributed Lag (ARDL) model is one of the most widely used models for testing the cointegration of study variables, especially in the case of time series with different degrees of integration, excluding that they are integral of order I(2), based on the Bounds test method proposed by Pesran et al. (2001), it is an alternative to the eigenvector test (VAR).

Numerous studies, such as Sun and Shin (1998), have demonstrated its effectiveness in analyzing long-term relationships between economic variables, especially in small sample sizes.

3.1 Presentation of Study Variables:

The variables include the total annual observations from 1991 to 2023, with a sample size of 33 observations. Algeria is the focus of the study population. The study variables are:

- GDP growth rate (%)
- Industrial employment rate (% of total employment)
- Foreign direct investment (FDI) flow rate (% of GDP)
- Trade openness rate ($\frac{\text{Imports} + \text{Exports}}{\text{GDP}}$) OPEN

Output

- Inflation rate (% annual)

All data was obtained from The World Bank website.

3.2 Analysis of Study Data:

A review of the statistical table covering the period from 1991 to 2023 reveals that the variables under study reflect the dynamic economic imbalances experienced by the economy.

The GDP variable shows that during the period under study it recorded both positive and negative rates. For example, it contracted in 1993 and 1994 with growth rates of -2.1% and -0.9% respectively, while it increased in 2002 and 2003 with growth rates of 5.4% and 6.5% respectively. This indicates that the GDP was unstable and was greatly affected by the political upheavals that Algeria experienced at that time, which were called during the Black Decade, the output recorded its lowest value (-5), and this was during the COVID-19 pandemic.

As for the employment variable in industry (EMPNP), employment rates recorded a notable improvement from a value of 24 to approximately 31 from the beginning to the end of the study period. The lowest rate in Algeria was recorded in 2003 at a value of (24), and the highest employment value was recorded in 2016 at a value of (31.38).

Although we observe an improvement in the pace, it remains insufficient to meet the demand for employment, which necessitates the continued specter of unemployment, and this remains one of the most prominent economic challenges and the social challenges facing Algeria.

Regarding the variable of foreign direct investment (FDI) flows, data indicates that they were almost nonexistent or nonexistent at the beginning of the study period.

However, in the early years of the millennium, they experienced a relative increase, reaching their highest level in 2001 at (1.87). Nevertheless, they remained

limited compared to the needs of the economy, indicating that the overall economic reforms production has not succeeded in attracting foreign capital and creating a favorable business climate, nor in playing its essential role within the economic diversification strategy.

Regarding the trade openness variable OPEN, we note through the statistics that it has witnessed a remarkable decline since the beginning of the study, from a value of (52.72) in 1991 to a gradual decrease to negative rates, the lowest of which was recorded in 2023 with a value of (-71.88). This decline reflects the shrinking role of foreign trade in supporting the economy and the continued dependence of the Algerian economy on the oil sector and the weakness of the diversification policy.

As for the inflation variable INF, the table data shows that inflation rates witnessed a rise of (31.67) in 1992, after which the rates began to decline, and remained in fluctuations until they reached the lowest rate of (0.34) in 2000.

This reflects the existence of economic imbalances and weaknesses in economic policies, although the monetary and fiscal policies that reduced inflation rates remain insufficient and helpless in the face of imbalances.

Table 1. Development of study variables during the period 1991-2023

| | GDPG (annual %) | EMPND (% of total employment) | FDI (% of GDP) | OPEN (% of GDP) | INF (annual %) |
|------|----------------------------|--|---------------------------|----------------------------|---------------------------|
| 1991 | -1,2 | 25,28 | 0,03 | 52,72 | 25,89 |
| 1992 | 1,8 | 25,2 | 0,06 | 49,19 | 31,67 |
| 1993 | -2,1 | 25,07 | 0 | 44,92 | 20,54 |
| 1994 | -0,9 | 24,96 | 0 | 41,15 | 29,05 |
| 1995 | 3,8 | 24,93 | 0 | 37,25 | 29,78 |
| 1996 | 4,1 | 24,86 | 0,58 | 33,35 | 18,68 |
| 1997 | 1,1 | 24,82 | 0,54 | 29,46 | 5,73 |
| 1998 | 5,1 | 24,86 | 1,26 | 25,56 | 4,95 |
| 1999 | 3,2 | 24,73 | 0,6 | 21,66 | 2,65 |
| 2000 | 3,8 | 24,79 | 0,51 | 17,76 | 0,34 |
| 2001 | 3 | 25,01 | 1,87 | 13,87 | 4,23 |
| 2002 | 5,4 | 24,81 | 1,73 | 9,97 | 1,42 |
| 2003 | 6,5 | 24,68 | 0,87 | 6,07 | 4,27 |
| 2004 | 4,5 | 26,78 | 0,96 | 2,17 | 3,96 |
| 2005 | 5,4 | 27,54 | 1,08 | -1,72 | 1,38 |
| 2006 | 2,9 | 28,14 | 1,5 | -5,62 | 2,31 |
| 2007 | 3,1 | 28,79 | 1,18 | -9,52 | 3,68 |
| 2008 | 2,5 | 29,27 | 1,46 | -13,42 | 4,86 |
| 2009 | 1,2 | 29,89 | 1,83 | -17,31 | 5,74 |
| 2010 | 4,8 | 30,4 | 1,29 | -21,21 | 3,91 |
| 2011 | 3 | 30,86 | 1,18 | -25,11 | 4,52 |
| 2012 | 2,4 | 30,48 | 0,66 | -29 | 8,89 |
| 2013 | 2,6 | 30,15 | 0,74 | -32,9 | 3,25 |
| 2014 | 4,1 | 30,97 | 0,63 | -36,8 | 2,92 |

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|------|-----|-------|-------|--------|------|
| 2015 | 3,2 | 31,25 | -0,29 | -40,7 | 4,78 |
| 2016 | 3,9 | 31,38 | 0,91 | -44,59 | 6,4 |
| 2017 | 1,5 | 30,98 | 0,65 | -48,49 | 5,59 |
| 2018 | 1,4 | 30,72 | 0,75 | -52,39 | 4,27 |
| 2019 | 0,9 | 30,65 | 0,71 | -56,29 | 1,95 |
| 2020 | -5 | 30,68 | 0,69 | -60,18 | 2,42 |
| 2021 | 3,8 | 30,91 | 0,47 | -64,08 | 7,23 |
| 2022 | 3,6 | 30,74 | 0,41 | -67,98 | 9,27 |
| 2023 | 4,1 | 30,8 | 0,49 | -71,88 | 9,32 |

Source: Prepared by researchers based on the World Bank website.

3.3 Extended Unit Root Test:

The time series stationarity test relies heavily on the presence or absence of a unit root. The presence of a unit root indicates series instability and also suggests spurious regression, which hinders economic analysis.

Several tests exist, and in our study, we will use the extended Dickey-Fuller test. (Table follows) the following explains the test results on the study variables:

Table 2. Results of the ADF time series stability test for the variables

| Test | | Augmented Dickey Fuller | | | | | Result |
|-------|--------------|-------------------------|-------|-------|-------|---------|-----------------|
| | | T stat | Level | | | | |
| | | | 1% | 5% | 10% | Prob | |
| GDPG | Constant | -4,23 | -3,65 | -2,95 | -2,61 | 0,0023 | Level |
| | Linear Trend | -4,16 | -4,27 | -3,55 | -3,21 | 0,013 | |
| | None | -1,21 | -2,64 | -1,95 | -1,61 | 0,2009 | |
| EMPND | Constant | -0,49 | -3,65 | -2,95 | -2,61 | 0,8801 | Level |
| | Linear Trend | -1,23 | -4,27 | -3,55 | -3,21 | 0,88449 | |
| | None | 1,93 | -2,63 | -1,95 | -1,61 | 0,9852 | |
| | Constant | -3,9 | -3,66 | -2,96 | -2,61 | 0,0055 | 1 st difference |
| | Linear Trend | -3,83 | -4,28 | -3,56 | -3,21 | 0,0279 | |
| | None | -3,6 | -2,64 | -1,95 | -1,61 | 0,0008 | |
| FDI | Constant | -2,88 | -3,65 | -2,95 | -2,61 | 0,057 | Level |
| | Linear Trend | -2,76 | -4,27 | -3,55 | -3,21 | 0,2198 | |
| | None | -1,4 | -2,63 | -1,95 | -1,61 | 0,145 | |
| | Constant | -5,88 | -3,67 | -2,96 | -2,61 | 0 | 1 st difference |
| | Linear Trend | -6,15 | -4,29 | -3,56 | -3,21 | 0,0001 | |
| | None | -5,97 | -2,64 | -1,95 | -1,61 | 0 | |
| OPEN | Constant | 1,96 | -3,67 | -2,96 | -2,62 | 0,9997 | Level |
| | Linear Trend | -14,63 | -4,27 | -3,55 | -3,21 | 0 | |
| | None | 1,64 | -2,64 | -1,95 | -1,61 | 0,97 | |
| | Constant | -24,64 | -3,66 | -2,96 | -2,61 | 0,001 | 1 st difference |
| | Linear Trend | -38,81 | -4,29 | -3,56 | -3,21 | 0 | |
| | None | 0,44 | -2,64 | -1,95 | -1,61 | 0,805 | |
| INF | Constant | -2,22 | -3,65 | -2,95 | -2,61 | 0,2009 | Level |
| | Linear Trend | -1,74 | -4,27 | -3,55 | -3,21 | 0,7055 | |
| | None | -2,08 | -2,63 | -1,95 | -1,61 | 0,0373 | |
| | Constant | -5,95 | -3,66 | -2,96 | -2,61 | 0 | 1 st difference |
| | Linear Trend | -6,54 | -4,28 | -3,56 | -3,21 | 0 | |
| | None | -5,9 | -2,64 | -1,95 | -1,61 | 0 | |

Source: Prepared by the researchers based on the outputs of the Eviews 12 program.

We note from the table above that the results of the ADF test show that GDPG is stationary at the level because the statistical t values at the level were highly significant ($\text{Prob} = 0.0023 < 0.05$), and thus the null hypothesis, which assumes the existence of a unit root, is rejected, meaning that GDPG is stationary at the level, and the degree of integration is zero $I(0)$.

As for the EMPNP (Employment in Industry) variable, it was not stationary at the level because the statistical values were not statistically significant. Therefore, we

accept the null hypothesis, meaning the variable is not stationary at the level. When applying the test at the first difference, we conclude that the variable is stationary, and thus it is stationary at the first difference and is an I(1) integral.

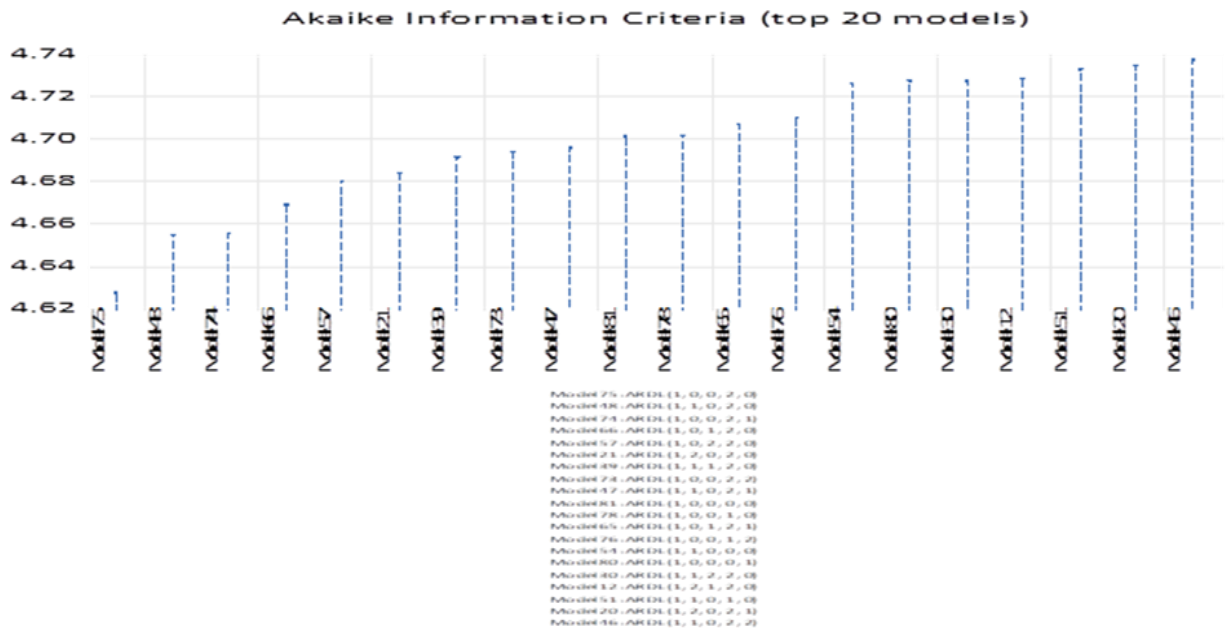
Likewise, for the remaining variables, foreign direct investment flows (FDI), the trade openness rate variable (OPEN), and the inflation variable (INF), they were not stationary at the level. Rather, the results shown through the table indicate that they are stationary at the first difference. Therefore, the variables are stationary at the first difference and are integrated of the first order (I(1)).

Based on these results, the integration of the study variables is a combination of I(1) and I(0), therefore, the most appropriate methodology is the Bounds Test.

3.3 Testing the optimal lag periods for the model:

Based on the AIC criterion, the lag periods were determined, from which the best 20 models were selected. Therefore, the optimal model is: Model 75: ARDL (1,0,0,2,0), which represents the number of optimal periods for the study variables. The following figure shows the results:

Fig.2. Results of the test of optimal slowing periods for the model.



Source: Prepared by the researchers using Eviews 12 output.

3.3 ARDL Model Estimation:

The following table shows the results of the ARDL model estimation for the study model:

Table 3. Model Estimation Results.

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Dependent Variable: GDPG
 Method: ARDL
 Date: 09/12/25 Time: 20:02
 Sample (adjusted): 1993 2023
 Included observations: 31 after adjustments
 Maximum dependent lags: 1 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (2 lags, automatic): EMPND FDI OPEN INF
 Fixed regressors: C
 Number of models evaluated: 81
 Selected Model: ARDL(1, 0, 0, 2, 0)

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|--------------------|-------------|-----------------------|-------------|--------|
| GDPG(-1) | 0.186242 | 0.208053 | 0.895165 | 0.3800 |
| EMPND | -0.238360 | 0.387076 | -0.615797 | 0.5441 |
| FDI | 0.251814 | 0.979544 | 0.257072 | 0.7994 |
| OPEN | 28.33735 | 12.58123 | 2.262352 | 0.0341 |
| OPEN(-1) | -11.95268 | 6.312288 | -1.893557 | 0.0709 |
| OPEN(-2) | -16.38866 | 8.856444 | -1.850479 | 0.0771 |
| INF | -0.015637 | 0.088250 | -0.177184 | 0.8609 |
| C | 183.3703 | 80.73404 | 2.271288 | 0.0328 |
| R-squared | 0.313688 | Mean dependent var | 2.803226 | |
| Adjusted R-squared | 0.104811 | S.D. dependent var | 2.319121 | |
| S.E. of regression | 2.194223 | Akaike info criterion | 4.627170 | |
| Sum squared resid | 110.7362 | Schwarz criterion | 4.997231 | |
| Log likelihood | -63.72113 | Hannan-Quinn criter. | 4.747800 | |
| F-statistic | 1.501781 | Durbin-Watson stat | 2.183774 | |
| Prob(F-statistic) | 0.216073 | | | |

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

Source: Prepared by the researchers using Eviews 12 output.

The estimation results indicate that the lagging value of the GDP growth rate has a positive coefficient and is not statistically significant. This suggests that the output is not based on a cumulative base from previous periods but is determined by current conditions, reflecting the fragility of the economy.

As for the industrial employment variable (EMPND), its coefficient was negative and insignificant, indicating its weak contribution to stimulating the gross domestic product, and thus stimulating economic growth during the study period, which reflects the low productivity of jobs in the industrial sectors.

Regarding the FDI (Foreign Direct Investment) flows variable, its coefficient is positive and not significant, but the lagging values showed a negative and significant effect, indicating that short-term flows are insufficient to support output, which is reflected in supporting economic growth.

As for the trade openness variable OPEN, the results show that its coefficient is positive and not significant, while the lagging values are negative and not significant. Therefore, trade openness does not make a clear contribution to the output, and thus does not support economic growth. This can be explained by the fact that the Algerian economy is dependent on hydrocarbons.

For the inflation variable (INF), the coefficient was negative and insignificant, indicating that price fluctuations were not a statistically significant factor in explaining output, and therefore did not affect economic growth.

The coefficient of determination (R^2) was 0.31, indicating that the independent variables explain only 31% of the variance in output. This is a relatively low level, but it remains consistent with the reality of developing economies the output and growth of which are affected by structural factors and broader macroeconomic policies make the model explanatory in significance despite its limited statistical power.

3.4 Bounds Test:

To confirm the existence of cointegration among the study variables, the Bounds Test was applied. The results below show that the calculated F-value was 3.7267,

which is greater than the tabulated value at a significance level of 10%. Therefore, we reject the null hypothesis, which states that no cointegration exists, and conclude that there is cointegration among the variables.

At a significance level of 5%, the calculated F value was in the uncertainty zone, and therefore we cannot be certain whether there is integration or not. As for the significance level of 1%, the calculated F value is also between the two limits, and it is not sufficient to reject the null hypothesis at 1%.

We conclude that there is a cointegration relationship between the study variables at a significance level of 10%, which means that the variables are correlated in the long term during the study period 1991-2023.

Table 4. Results of the Bounds test.

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|--------------------|----------|---|-------|-------|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| F-statistic | 3.726759 | 10% | 2.2 | 3.09 |
| | | 5% | 2.56 | 3.49 |
| | | 2.5% | 2.88 | 3.87 |
| | | 1% | 3.29 | 4.37 |
| Actual Sample Size | 31 | 10% | 2.45 | 3.46 |
| | | 5% | 2.947 | 4.088 |
| | | 1% | 4.093 | 5.532 |
| | | 10% | 2.525 | 3.56 |
| | | 5% | 3.058 | 4.223 |
| | | 1% | 4.28 | 5.84 |

Source: Prepared by the researchers using Eviews 12 output.

3.5 Estimating the Long-Term Relationship:

The following table shows the results of estimating the long-term relationship for the model under study:

Table 5. Results of estimating the long-term relationship of the model.

ARDL Long Run Form and Bounds Test
 Dependent Variable: D(GDPG)
 Selected Model: ARDL(1, 0, 0, 2, 0)
 Case 2: Restricted Constant and No Trend
 Date: 09/13/25 Time: 00:31
 Sample: 1991 2023
 Included observations: 31

| Conditional Error Correction Regression | | | | |
|---|-------------|------------|-------------|--------|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 183.3703 | 80.73404 | 2.271288 | 0.0328 |
| GDPG(-1)** | -0.813788 | 0.209053 | -3.911308 | 0.0007 |
| EMPND** | -0.238360 | 0.387076 | -0.615797 | 0.5441 |
| FDI** | 0.251814 | 0.979544 | 0.257072 | 0.7994 |
| OPEN(-1) | -0.003984 | 0.033211 | -0.119960 | 0.9056 |
| INF** | -0.015637 | 0.088250 | -0.177184 | 0.8609 |
| D(OPEN) | 28.33736 | 12.58123 | 2.252352 | 0.0341 |
| D(OPEN(-1)) | 16.38866 | 8.856444 | 1.850479 | 0.0771 |

* 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. |
| EMPND | -0.292913 | 0.485939 | -0.602777 | 0.5526 |
| FDI | 0.309445 | 1.210739 | 0.255584 | 0.8005 |
| OPEN | -0.004896 | 0.041075 | -0.119190 | 0.9062 |
| INF | -0.019215 | 0.106267 | -0.180820 | 0.8581 |
| C | 225.3375 | 110.9896 | 2.030257 | 0.0541 |

EC = GDPG - (-0.2929*EMPND + 0.3094*FDI - 0.0049*OPEN - 0.0192*INF + 225.3375)

Source: Prepared by the researchers using Eviews 12 output.

The results from the ARDL (1,0,0,2,0) model estimate show that the ECM error correction coefficient is negative and significant at the 1% level, with a relatively high value of (-0.81). This means that approximately 81% of short-term imbalances are corrected within one year, indicating a long-term equilibrium relationship between

output and independent variables. In other words, the Algerian economy is returning to its normal trajectory relatively quickly. He maintains his balance despite the shocks he experiences.

We also note from the table that the employment coefficient in industry (EMPNP) is negative (-0.229), which means that a 1% increase in it leads in the long run, the output decreased by about 0.22%, although the relationship is not statistically significant. The negative sign reflects that employment in industry in Algeria is quantitative rather than qualitative, meaning that it does not depend on productive efficiency during the study period, which made it unable to boost output that is reflected in long-term economic growth.

As for the FDI (Foreign Direct Investment) flows coefficient, we note that it is positive (0.309) and not significant. Every 1% increase in it increases output by 0.30% in the long term, which indicates that direct investment flows were not a driving force for output, and therefore for economic growth.

As for the trade openness coefficient OPEN, it is positive and very weak (0.0049), meaning that increasing it by 1% leads to a slight increase in output of 0.005%, which is a statistically insignificant result, reflecting that trade openness during the study period was not a stimulus for output and therefore for economic growth. This can be explained by the fact that during most of the study period Algeria was heavily dependent on oil exports.

We also note that the inflation coefficient INF is positive (0.019) and not statistically significant, and that a 1% increase in it leads to an increase in output of 0.02%, which means that inflation in Algeria was not a strong determinant of output, and therefore of long-term economic growth.

For the constant C, its coefficient was positive (225, 3), close to the significance level, indicating that the result is related to other factors outside the model and that the studied variables alone do not explain the phenomenon.

3. 6 Estimating the short-term relationship and error correction parameters:

The results of the short-term model show that trade openness (OPEN) is the variable that most significantly influences output during the study period, as its coefficients demonstrated strong statistical significance. This means that any change in the degree of trade openness is quickly reflected in output and, consequently, in economic growth.

In addition, the error correction coefficient is negative (-0.81) and significant, which means that 81% of short-term imbalances are corrected within one year, confirming the existence of a strong equilibrium relationship between the variables in the long term.

Table 6. Results of short-term relationship estimation and error correction parameter.

ARDL Error Correction Regression
 Dependent Variable: D(GDPG)
 Selected Model: ARDL(1, 0, 0, 2, 0)
 Case 2: Restricted Constant and No Trend
 Date: 09/13/25 Time: 00:35
 Sample: 1991 2023
 Included observations: 31

| ECM Regression | | | | |
|--|-------------|-----------------------|-------------|--------|
| Case 2: Restricted Constant and No Trend | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(OPEN) | 28.33736 | 5.287526 | 5.359285 | 0.0000 |
| D(OPEN(-1)) | 16.38866 | 4.371869 | 3.748663 | 0.0010 |
| CointEq(-1)* | -0.813758 | 0.155969 | -5.217427 | 0.0000 |
| R-squared | 0.512389 | Mean dependent var | 0.074194 | |
| Adjusted R-squared | 0.477559 | S.D. dependent var | 2.751359 | |
| S.E. of regression | 1.988684 | Akaike info criterion | 4.304589 | |
| Sum squared resid | 110.7362 | Schwarz criterion | 4.443362 | |
| Log likelihood | -63.72113 | Hannan-Quinn criter. | 4.349825 | |
| Durbin-Watson stat | 2.183774 | | | |

* p-value incompatible with t-Bounds distribution.

Source: Prepared by the researchers using Eviews 12 output.

3.7 Diagnostic Tests:

To determine whether the model can be relied upon for sound economic analysis, we will perform the following set of diagnostic tests:

3.7.1 Breusch-Godfrey Serial Correlation Test:

From the table below, we observe that (Prob F = 0.2834) and (Prob Chi-squared = 0.1731), both greater than the 5% significance level, indicate that we accept the null hypothesis, and therefore, there is no autocorrelation.

Consequently, the model does not suffer from the autocorrelation problem, and the estimates are unbiased.

Table 7. Results of the Breusch-Godfrey Serial Correlation test.

| Breusch-Godfrey Serial Correlation LM Test: | | | |
|--|----------|---------------------|--------|
| Null hypothesis: No serial correlation at up to 2 lags | | | |
| F-statistic | 1.339919 | Prob. F(2,21) | 0.2834 |
| Obs*R-squared | 3.508258 | Prob. Chi-Square(2) | 0.1731 |

| Test Equation: | | | |
|---|--|--|--|
| Dependent Variable: RESID | | | |
| Method: ARDL | | | |
| Date: 09/13/25 Time: 00:41 | | | |
| Sample: 1993 2023 | | | |
| Included observations: 31 | | | |
| Presample missing value lagged residuals set to zero. | | | |

Source: Prepared by the researchers using Eviews 12 output.

3.7.2 Heteroskedasticity ARCH test:

We observe from the table that the probability value of F (Prob F = 0.7128) is greater than the 5% significance level. Therefore, we accept the null hypothesis, meaning there is no variance problem (the errors are homogeneous).

Table 8. Results of the Heteroskedasticity ARCH test.

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| Heteroskedasticity Test: ARCH | | | |
|-------------------------------|----------|---------------------|--------|
| F-statistic | 0.138293 | Prob. F(1,28) | 0.7128 |
| Obs*R-squared | 0.147443 | Prob. Chi-Square(1) | 0.7010 |

Test Equation:
 Dependent Variable: RESID^2
 Method: Least Squares
 Date: 09/13/25 Time: 00:45
 Sample (adjusted): 1994 2023
 Included observations: 30 after adjustments

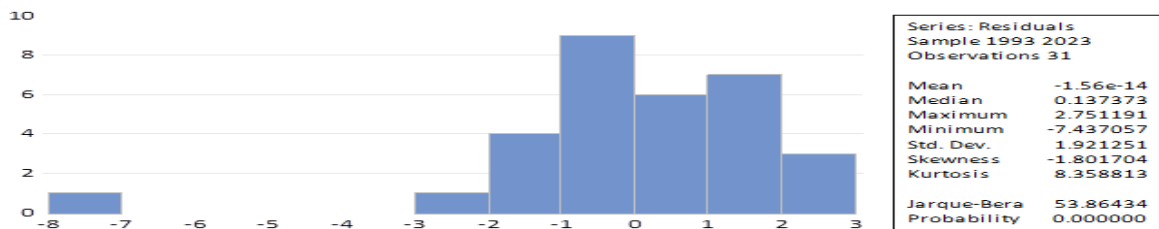
Source: Prepared by the researchers using Eviews 12 output.

3.7.3 Jarque-Bera Normality Test:

We observe from the figure below that the Jarque-Bera probability value is less than the 5% significance level. Therefore, we reject the null hypothesis, which states that the residuals are normally distributed, i.e., they do not follow a normal distribution.

This is a methodological limitation that partially restricts the strength of the statistical inference, but it remains common in economic studies and does not affect the validity of the model, especially since all other diagnostic tests are sound.

Fig.3. Results of the Jarque-Bera normality test.



Source: Prepared by the researchers using Eviews 12 output.

3.7.4 Model Validation Test (Ramssey Test):

The results of the Ramsey test, as shown in the table, indicate that the calculated F-value (0.5689) is greater than the 5% significance level, meaning we accept the null hypothesis, i.e., the model is correctly defined.

Table 9. Model Validation Test Results.

| Ramsey RESET Test | | | |
|---|------------|---------|--------------|
| Equation: UNTITLED | | | |
| Omitted Variables: Squares of fitted values | | | |
| Specification: GDPG GDPG(-1) EMPND FDI OPEN OPEN(-1) OPEN(-2) | | | |
| INF C | | | |
| | Value | df | Probability |
| t-statistic | 0.578394 | 22 | 0.5689 |
| F-statistic | 0.334539 | (1, 22) | 0.5689 |
| Likelihood ratio | 0.467848 | 1 | 0.4940 |
| F-test summary: | | | |
| | Sum of Sq. | df | Mean Squares |
| Test SSR | 1.658670 | 1 | 1.658670 |
| Restricted SSR | 110.7362 | 23 | 4.814617 |
| Unrestricted SSR | 109.0775 | 22 | 4.958069 |
| LR test summary: | | | |
| | Value | | |
| Restricted LogL | -63.72113 | | |
| Unrestricted LogL | -63.48720 | | |

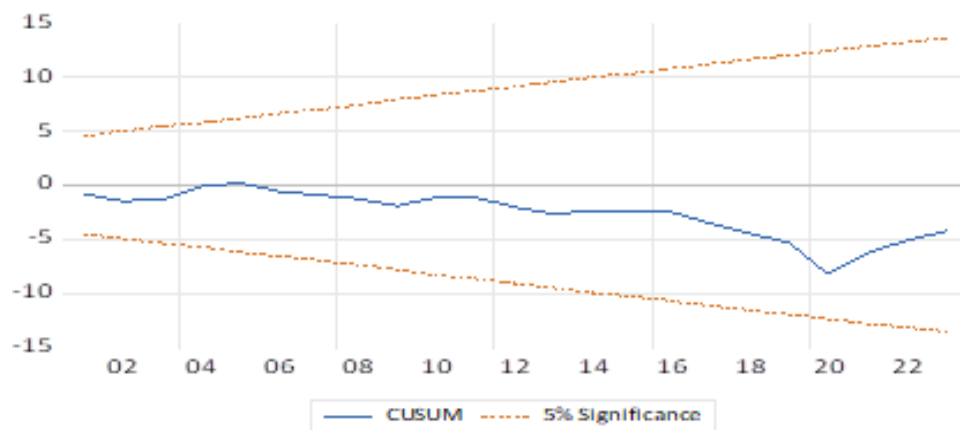
Source: Prepared by the researchers using Eviews 12 output.

3.7.5 Structural Stability Test for the Estimated ARDL Model Parameters:

As shown in the figure below, the CUSUM test results indicate that the graph remained within the critical limits at a 5% significance level throughout the study period. This demonstrates that the model parameters are generally stable and that economic changes did not significantly affect the estimated relationship structure.

However, the CUSUM Q test showed a slight deviation of the line from the boundary in the later stages of the studied period, which suggests the presence of some partial structural imbalances. Upon closer examination of the figure, we see that the temporary structural imbalance is likely related to major economic shocks, such as the sharp decline in oil prices in 2014 and the COVID-19 global health crisis in 2020.

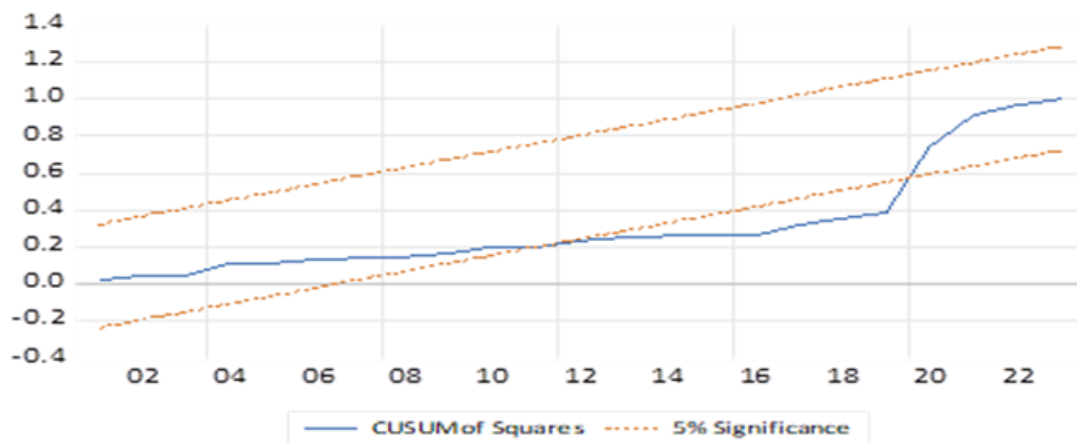
Fig.4.Results of the CUSUM structural stability test



Source:
Prepared by
the
researchers
using Eviews
12 output.

**Fig.5.Results
of the
CUSUM Q**

structural stability test.



Source: Prepared by the researchers using Eviews 12 output.

Based on the observations and conclusions drawn from the results, the model exhibits an acceptable degree of structural stability, despite exposure to periods of severe economic crises that led to partial breakdowns in stability.

4. CONCLUSION

Our research paper examined the role of the manufacturing industry in achieving

economic development by studying various variables that reflect the economic reality of Algeria.

The benchmark study showed that the manufacturing industry in Algeria failed to fulfill its role during the period 1991-2023. Its impact remained weak and insignificant in both the long and short term. This was due to the Algerian economy's reliance on the rentier sector, which limited the manufacturing industry's contribution to development, in addition to the low returns on foreign investment and trade liberalization despite the policies implemented, this is due to a lack of effective integration into the local industrial fabric.

Therefore, we can offer the following recommendations and suggestions:

- Reorienting existing economic policies by strengthening the industrial sector and diversifying the production base.
- Directing investments towards high value-added industries, particularly those related to technology and renewable energy.
- Improving the business climate by simplifying administrative procedures and strengthening transparency.
- Intensifying integration between manufacturing, agriculture, and logistics, enabling the development of integrated production chains high efficiency strengthens economic diversification policies, which reduce dependence on the rentier sector.

Ultimately, the greatest challenge remains translating the study's recommendations into practical policies capable of building the foundations for genuine economic development that transcends rentier-based growth and is resilient to external shocks.

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