



## ANALYZING AND ASSESSING THE DETERMINANTS OF ECONOMIC DIVERSIFICATION AND ITS IMPACT ON ECONOMIC GROWTH IN ALGERIA FOR THE PERIOD (2000-2023)

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Send Article Date: 23-08-2025

Date of acceptance of the article: 11-09-2025

### Abstract:

This study aims to analyze and measure the impact of the degree of economic diversification factors on Algerian economic growth, based on an analysis of the evolution of the structure of some economic variables, with the aim of achieving the goal of economic diversification, and with the help of economic measurement tools in analyzing the collected data on the study variables, it was found that there are statistically significant and standard effects and a long-term relationship between the change in the gross domestic product and some economic variables. However, it is weak due to the lack of activation of various sectors and their interconnectedness to contribute to achieving sustainable economic growth.

**Keywords:** economic growth, economic diversification, Algerian economy, sustainable development.

### Introduction:

Economic diversification is an important option for achieving sustainable development in rentier economies. It is a topic of great interest to both developed and developing countries. Many economic studies have shown the importance of economic diversification in countries affected by Dutch disease in avoiding the risks resulting from the adverse effects of oil

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price fluctuations in international markets, the effects of which are reflected on all macroeconomic indicators. Therefore, adopting an economic diversification strategy is one of the solutions proposed in rentier countries to ensure economic sustainability by implementing development policies aimed at building a diversified economy that achieves stability and sustainable economic development.

The Algerian economy, like other oil economies, is characterised by structural imbalances resulting primarily from the significant dominance of the oil sector in contributing to the gross domestic product.

In the context of declining oil revenues as a result of the decline in oil prices, Algeria sought to diversify its production base to achieve high levels of economic growth by adopting a package of broad-based diversified economic policies, the goal of which is to restructure the economy and raise the level of contribution of various alternative economic sectors to the gross domestic product, to reduce dependence on oil and achieve economic diversification.

### **Study Problem:**

Given the critical importance of diversification in increasing growth rates, this study will attempt to understand the impact of diversifying the economic base on contributing to the creation of new sources of income. Through several indicators that will be used to measure the degree of diversification and evaluate its impact on economic growth in the Algerian economy during the period (2000-2023), the following problem is raised:

To what extent did economic diversification contribute to raising Algerian economic growth during the period (2000-2023)?



## **Importance of the study:**

The importance of the study lies in highlighting the following points:

- Analyzing the reality of economic diversification in Algeria, while clarifying the danger of relying on hydrocarbon revenues to finance development policies, given that many countries rely heavily on oil as a primary source of revenue. Understanding the contribution of non-oil sectors can reduce this dependence.
- Working to increase productivity, as developing non-oil sectors can contribute to increasing the overall productivity of the economy, by analyzing the role played by the economic diversification strategy in opening new areas of added value, and thus diversifying the sources of the general budget.
- Working to develop appropriate development policies, because understanding the nature of the relationship (statistically significant or not?) between diversification and economic growth can help governments formulate appropriate policies that support diversification as a primary driver of growth in policy formulation, which will lead to increased economic growth rates.

## **Study objectives:**

The study objectives are as follows:

- Identifying the reality of economic diversification in Algeria, and identifying the most important options for the Algerian economy.
- Explaining how the economic diversification policy contributes to achieving sustainable development, and identifying the most important sectors that can be an alternative to oil in the economy.
- Analyzing and measuring the impact of some variables contributing to achieving economic diversification.

## Study Methodology:

To fully understand the subject matter, the descriptive analytical approach was adopted in the theoretical aspect to present the conceptual framework of economic diversification, in addition to analyzing the reality of economic diversification in Algeria. The experimental approach was also adopted using standard tools in the applied aspect in order to measure the degree of impact of economic diversification outside the oil sector on economic growth based on the outputs of the Eviews program.

## SECTION I: Theoretical framework of the study

### 1-1- The concept of economic diversification:

Many definitions of economic diversification have been proposed, varying depending on the perspective from which the phenomenon is viewed. Some relate to production and sources of income, while others relate to the commercial structure of the economy. Diversification relates to development policies that focus on reducing dependence on a single element and diversifying the commercial sphere by orienting the economy toward a winter economy, or diverse markets to reduce the risks of relying on a single product with fluctuations in its prices. Among the most important definitions we find the following:

According to economist Berthéleny Claude Jean, an economy is said to be diversified if its production structure is distributed across the largest possible number of economic activities that are distinct from each other (Ben Jelloul et al., 2019, p. 55).

-Economic diversification is also defined as reducing dependence on a single resource by moving to a stage of strengthening the industrial and agricultural base and creating a production base, which contributes to building a sound national economy that



moves towards self-sufficiency in more than one sector. (Boutalaa and Ben Debish, 2018, p. 300)

-Economic diversification is defined as a process that aims to diversify the production structure and create new income-generating sectors, such that such diversification contributes to reducing total dependence on the revenues of the primary sector in the economy, this process also leads to the opening of new fields with higher added value and the ability to provide more productive employment opportunities for the workforce, which in turn will lead to higher growth rates in the long term (Daif and Azouz, 2018, p. 22).

-Economic diversification is defined as the desire to direct the economy toward diverse, highly productive commodity or service sectors. It reflects the desire to reduce economic risks, mitigate the impact of crises and external shocks on the local economy, and enhance interconnectedness among various sectors (Lazar, 2017, p. 9).

-Economic diversification also means the process of creating structural changes in the economic and social structure and production relations with the aim of creating diversification in sources of income, by adopting an approach based on tight integration between various sectors and activities (Atef, 2013, p. 8).

In summary, we can say that the meaning of diversification involves the desire to achieve a greater number of basic sources of income in the country, which would enhance its real capabilities within the framework of global competitiveness, through expanding the economic base and establishing the pillars of a real economy consisting of a productive, financial and service base that contributes to creating multiple sources of sustainable income.

## 1-2- Indicators of economic diversification:

These indicators are considered evidence of the level of economic diversification, primarily related to the performance of the country's overall economy. The most important of these are the following: (Daif, 2017, p. 196).

- The degree of structural change: This is the percentage of contribution of the oil sectors compared to the non-oil sectors to the GDP, in addition to the growth or shrinkage of the contribution of these sectors over time. It is also useful to measure the real growth rates of the GDP by sector when data is available.

- The degree of GDP instability and its relationship to oil price instability: It is clear that diversification is supposed to reduce instability over time.

- The development of oil revenues as a percentage of total state revenues: This means the rate of expansion of the non-oil revenue base over time.

- Development and composition of non-oil exports: While the steady rise in non-oil exports indicates increased economic diversification, short-term changes in this indicator may be misleading, as they can result from fluctuations in oil prices and exports.

- Sectoral distribution of the labor force: This measure reflects and reinforces changes in the

sectoral composition of GDP.

- The percentage of contribution of both the public and private sectors to the gross domestic product:

This is an important indicator in oil-producing countries, because economic diversification in these countries assumes



growth in the private sector's contribution to overall economic activity.

These indicators indicate the extent of economic diversification in the country, but they do not give us an accurate degree of diversification, due to the dispersion and difference of indicators used to determine the extent of diversification. Also, using the percentages of change in the output of sectors to the gross domestic product as an indicator of the sectoral composition of the economy may not be accurate. Especially when sudden changes occur in these ratios as a result of fluctuating weather conditions, a recession, or fluctuations in natural resource prices, for example, focusing on the growth of specific sectors as an indicator of growth is not necessarily correct, because these sectors may grow without real development occurring when the industrial sector emerges as a pocket in the national economy isolated from the rest of its sectors. Therefore, one of the important things in measuring the progress of the economy is to identify the degree of interconnectedness between sectors over time.

### **1-3-Economic diversification mechanisms to establish economic sustainability in Arab countries:**

Some believe that diversifying sources of income and not relying on a single economic resource is a strategic direction for development, in order to achieve sustainable development that possesses the elements of survival and continuous development, because there is a common link between economic diversification and sustainability in that they represent two essential elements in achieving a sustainable economy. Therefore, economic diversification can reduce the country's economic fluctuations and increase its actual activity.

Economic diversification, from a sustainable development perspective, is a guarantee of long-term economic stability, as it

is the process of expanding the scope of economic activities through the production and diversification of goods and services. It does not necessarily mean only increasing output, but rather enhances the stability of economies by diversifying their economic base. Economic diversification also has the tendency to meet the basic needs of sustainable development, such as meeting the basic needs of the poor, and opening up diverse areas of economic activity away from the exploitation of one aspect of the natural resources that are threatened with extinction. In addition, diversification establishes an economy based on abundance and ensuring justice within and between generations alike. Among the most important mechanisms contributing to achieving sustainability in Arab countries, we find the following: (Ballama, 2020, pp. 91-92).

Giving a strong impetus to industrialization: Achieving economic diversification in Arab oil economies requires a major push towards industrialization, and this can only happen through a leap that does not take into account the narrow and short-term profit and loss calculations of institutions. Rather, this must be overcome through the massive employment and utilization of surplus and informal labor, which amounts to up to 50% in these economies, and which is wasted in unproductive and superficial work.

- Enhancing the productivity and competitiveness of Arab countries: While some Arab countries have succeeded in improving the business environment and encouraging the role of the private sector in creating added value and job opportunities, there is still a need to adopt policies aimed at ensuring a more suitable and encouraging environment for the private sector, focusing on increasing the levels of flexibility of labor and product markets in order to enhance productivity and competitiveness.



- Human capital formation: Human capital formation in Arab countries is extremely important, as it impacts not only human development and unemployment, but also the long-term sustainability of a diversified, knowledge-based, private-sector-led economic model. To accelerate human capital formation, it is necessary to ensure effective policy coordination and implementation that ensures skills improvement and creates a vibrant and dynamic private sector.
- Increasing employment in the private sector: especially since reliance has begun on this sector to bring high technologies and productivity to the non-oil sectors. Encouraging employment in the private sector can also be accompanied by raising the quality of education and developing skills in order to boost productivity and competitiveness in employment in the private sector.
- Enhancing the ability of national companies to discover themselves: It is recommended to work on enhancing the ability of national companies to discover new economic activities and sectors, to identify the cost of production and the level of risks and returns thereon, especially by creating the appropriate conditions and factors for research, development, and innovation. It also advocates for developing industrial clusters that focus on encouraging relationships between groups of companies that produce a particular good or service, and those that supply raw materials, markets, and customers, and that utilize the same infrastructure, information and communications technology, and services.
- Developing public-private partnerships: Public-private partnership initiatives must be strengthened to increase the private sector's contribution to the gross domestic product, provide additional opportunities for financing infrastructure projects, improve the efficiency of public spending and investment project management, and create more job

opportunities, which is of paramount importance in young Arab societies.

- Diversifying service activities: This is achieved by improving the quality of activities within the service sector and shifting from public services and traditional services such as tourism and transportation to services with a high knowledge content, especially productive services such as communications, financial services, engineering and design services, and digital information systems. The services sector is one of the promising sectors that can contribute to diversifying Arab economies, especially financing services and providing financial and administrative consulting. The knowledge-based industries sector, based on the digital economy, also provides tremendous opportunities, as it is full of opportunities that enable young people to establish their projects in light of the tremendous development in the communications industry and e-commerce.

- Improving the efficiency of public spending: This can be achieved by gradually isolating government expenditures (specifically current expenditures) from volatile oil revenues, thereby enhancing growth trajectories and macroeconomic stability in Arab countries. It is essential to have strong public financial management capable of providing forecasts of resource revenues, and identifying financial risks on both revenue and expenditure sides, without neglecting the need to introduce methods for evaluating both productivity and expenditure programmes, either before or shortly after implementation, so that they can be addressed in a timely manner.

Preparing investment maps: Investment maps represent a document that crystallizes and clarifies a list of possible and potential investment ideas and opportunities in a country, region, or sector, in addition to including all the requirements and components necessary for the success of the process of transforming and translating these ideas and opportunities into



real projects and activities. This document also identifies the economic and financial feasibility of the list of listed projects, as well as their geographic diversification. Therefore, investment maps are one of the mechanisms that Arab oil economies must resort to as a means of increasing investment and directing it optimally, thus contributing to accelerating the pace of economic diversification.

- Working towards sustainable financing: Implementing economic plans and visions aimed at diversification requires significant financial resources over time. This requires providing stable sources of financing, such as local resources, with the participation of the private sector and small and medium-sized enterprises in the financing process, without neglecting to consider innovative financing mechanisms such as Islamic finance.

## **SECTION II: The applied framework of the study:**

### **2-1- Analysis of the diversification index of the contribution of economic sectors to the gross domestic product:**

The gross domestic product (GDP) and the contribution of the economic sectors to its formation are among the most important indicators of the degree of diversity achieved by a country. The GDP in Algeria consists of the following sectors:

Fuels, agriculture, industry, transportation, communications, construction and public works, and the service sector. To assess the extent to which Algeria has achieved economic diversification in terms of economic and social indicators, we will address diversification in the percentage of economic sectors' contribution to the gross domestic product.

- Development of the GDP growth rate: Through the following table, we will discuss the economic growth rate in Algeria for the period extending from (2000-2023).

**Table No. 1: Development of Algeria's economic growth rate during the period (2000-2023)**

| years                        | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|------------------------------|------|------|------|------|------|------|------|------|
| <b>Economic growth rate%</b> | 3.8  | 3    | 5.6  | 7.2  | 4.3  | 5.9  | 1.7  | 3.4  |
| years                        | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| <b>Economic growth rate%</b> | 2.4  | 1.6  | 3.6  | 2.9  | 3.4  | 2.8  | 3.8  | 3.7  |
| years                        | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| <b>Economic growth rate%</b> | 3.2  | 1.3  | 1.2  | 1    | -5.1 | 3.4  | 3.2  | 5.3  |

Source: Prepared by the researcher based on World Bank data.

For further clarification, we note the figure representing the development of Algeria's economic growth rate during the period (2000-2023).

**Figure 1: Development of Algeria's economic growth rate during the period (2000-2023)**

Source: Prepared by the researcher

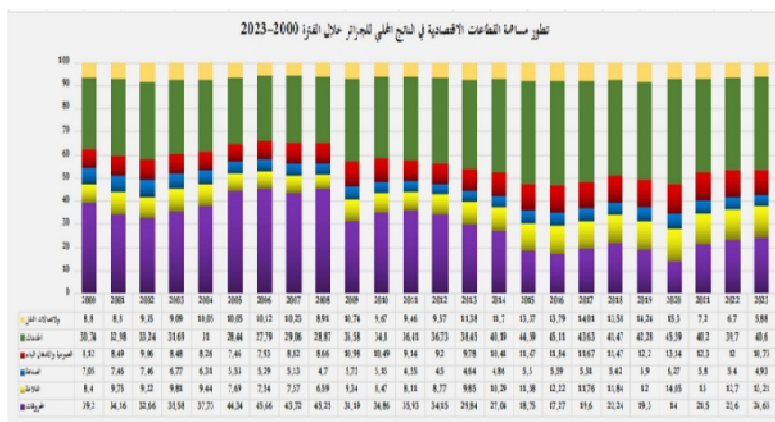


We notice from the figure that the economic growth rate of Algeria fluctuates between high and low, as it was estimated in 2000 at 3.8%, then decreased in 2009 to 1.6%, and this is due to the decline in oil prices. It rose again to 3.2% in 2016, then decreased again in 2017, and this is due to the repercussions of the decline in oil prices in international markets as a result of the 2014 crisis. It then continued to decline to -5.1% in 2020, due to the decline in oil prices in global markets as a result of the global health crisis, Covid-19. After that, we notice an improvement in Algeria's economic growth rate, from which we conclude the strong link between fuel prices and Algeria's economic growth.

### - Contribution of economic sectors to GDP:

To assess the contribution of economic sectors to GDP, the Herfindahl-Hirschman Index of Sectoral Diversification is measured by calculating the percentage contribution of each of the main sectors: agriculture, hydrocarbons, industry, construction and public works, transportation and communications, trade, and services, to Algeria's GDP.

**Figure 2: Evolution of the contribution of economic sectors to Algeria's GDP during the period (2000-2023)**



Source: Prepared by the researcher based on data from the Bank of Algeria and the National Office of Statistics

We note from the figure that the hydrocarbon sector is the dominant sector in terms of its contribution to Algeria's GDP during the study period, which was estimated at 39.2% in 2000, then rose to 45.25% in 2008, and decreased as a result of the global crisis of 2008 and the subsequent drop in oil prices in global markets in 2009 to 31.19%. Then we notice the sharp decline in the contribution rate of this sector in 2016, which reached 17.27% as a result of the global crisis of 2014. Then the contribution rate fell to its lowest levels in 2020, which was estimated at: 14% due to the repercussions of the global health crisis Covid 19 and the decline in oil prices in global markets, as well as the precautionary measures taken by most countries of the world to prevent the spread of the epidemic, which led to the economic growth rate declining to -5.1.

Therefore, the decline in the contribution of the hydrocarbon sector to the gross domestic product necessarily led to a decline in the economic growth rate as a result of the Algerian economy's connection to the oil sector.

The services sector comes in second place, and its contribution to GDP has increased over the study period. This is due to the youth support programmes adopted by the Algerian government as part of the development programmes to diversify the economic base in Algeria. Although the services sector has exceeded the contribution of the hydrocarbon sector, this only means that the reason is due to the decline in hydrocarbon prices in international markets and not to Algeria's diversification outside the hydrocarbon sector, then the construction and public works sector, followed by the transportation and communications sector, whose contribution was relatively stable. The industrial and agricultural sectors' contribution to GDP was weak, despite Algeria's efforts in both sectors to achieve economic diversification.



To determine the extent to which Algeria has achieved economic diversification, the Herfindahl-Hirschman index of diversification in GDP was calculated over the period 2000-2023.

**Table 2: Values of the Herfindahl-Hirschman Index for GDP Diversification in Algeria during the period 2000-2023**

|              |       |       |       |       |       |      |       |       |
|--------------|-------|-------|-------|-------|-------|------|-------|-------|
| <b>years</b> | 2000  | 2001  | 2002  | 2003  | 2004  | 2005 | 2006  | 2007  |
| <b>HHI</b>   | 0.26  | 0.2   | 0.19  | 0.22  | 0.22  | 0.24 | 0.32  | 0.33  |
| <b>years</b> | 2008  | 2009  | 2010  | 2011  | 2012  | 2013 | 2014  | 2015  |
| <b>HHI</b>   | 0.30  | 0.13  | 0.17  | 0.22  | 0.17  | 0.13 | 0.11  | 0.038 |
| <b>years</b> | 2016  | 2017  | 2018  | 2019  | 2020  | 2021 | 2022  | 2023  |
| <b>HHI</b>   | 0.038 | 0.063 | 0.069 | 0.065 | 0.053 | 0.15 | 0.157 | 0.17  |

**Source: Prepared by the researcher.**

We notice from the table the fluctuation in Hirschman's indicators of sectoral diversification in the GDP between rise and fall, as Hirschman's indicator of GDP diversification ranges between 0.038 and 0.30, where Hirschman's indicator was estimated in 2000 at: 0.27, then rose slightly and fell again to reach 0.13 in 200.

Then the Hirschman index rose slightly again until it fell to its lowest levels, which approached zero during the years extending from 2016 to 2020, where we note that the H.H index was estimated in 2020 at: 0.053, accompanied by a decrease in the contribution of the hydrocarbon sector to the GDP, which was estimated at: 14%. This is due to the Covid-19 crisis and the decline in oil prices, as Algeria's GDP decreased during 2020 and was estimated at: 18,383.8 billion dinars.

## 2-2- Standard Study:

### **First - Definition of study variables and their sources:**

- Human capital accumulation: Economists have long been interested in the positive role of worker training in the production process.
- Labor force: The labor force is defined as: “It includes the number of people who are able to work and willing to work, and who belong to specific age groups that differ according to the labor laws in force in the countries.

**Second-Accumulation of fixed capital:** The total formation of fixed capital (formerly gross domestic investment) consists of the total expenditures on increasing the fixed assets of the economy plus net changes in the level of inventories.

**Third - Gross Domestic Product:** It is an indicator of what a country produces, and its growth is an indicator of the speed of economic growth in the country as a whole. It is not an indicator of income distribution, and an increase in it does not mean a reduction in poverty.

**Fourth-The composite index of economic diversification:** Economic diversification in its broad sense is not limited to diversification in sources of income, or the structure of the gross domestic product, but rather extends to creating diversification in the structure of exports, imports of the state, and employment. This study is based on considering economic diversification as a multidimensional phenomenon, and this index is considered a satisfactory measure of economic diversification because it is not based on a single dimension of economic diversification, but rather because it includes overlapping dimensions.



**Table No. 03: Study data sources.**

| The name                                    | Variable |
|---------------------------------------------|----------|
| Gross domestic product                      | PIB      |
| Accumulation of fixed capital               | CA       |
| workforce                                   | MD       |
| Accumulation of human capital               | HT       |
| Composite Index of Economic Diversification | CI       |

**Data source:** World Bank, Bank of Algeria, National Office of Statistics.

## **Second: Results of the stability of the study variables:**

**Table 4: Results of the ADF test for the unit root.**

| اختبار (ADF) التفاضل الأول |                     |           | اختبار (ADF) المستوى |                     |           | المخرجات           | المتغيرات |
|----------------------------|---------------------|-----------|----------------------|---------------------|-----------|--------------------|-----------|
| None                       | Trend and intercept | intercept | None                 | Trend and intercept | intercept |                    |           |
| 0.0250                     | 0.0484              | 0.0301    | 0.4717               | 0.5210              | 0.3502    | Prob               | PIB       |
| 3.045187                   | 3.917880            | 4.967040  | 1.003766             | 2.954318            | 1.900412  | القيمة الحرجة (5%) |           |
| 5.348617                   | 5.095386            | 5.609544  | 1.449041             | 2.278007            | 1.874576  | t:(ADF)            |           |
| 0.0415                     | 0.0203              | 0.0014    | 0.0615               | 0.3707              | 0.4501    | Prob               | CI        |
| 2.050087                   | 3.944104            | 3.655900  | 3.500013             | 3.004321            | 3.970012  | القيمة الحرجة (5%) |           |
| 5.001163                   | 4.251077            | 4.934482  | 2.281901             | 2.258925            | 2.390541  | t:(ADF)            |           |
| 0.0221                     | 0.0177              | 0.04302   | 0.2529               | 0.7709              | 0.1617    | Prob               | CA        |
| 2.922017                   | 3.501787            | 3.190230  | 2.300434             | 3.105797            | 3.945842  | القيمة الحرجة (5%) |           |
| 4.237901                   | 4.093275            | 3.890129  | 1.005210             | 1.661801            | 1.024428  | t:(ADF)            |           |
| 0.0294                     | 0.0445              | 0.0192    | 0.6637               | 0.6101              | 0.7774    | Prob               | MD        |
| 2.045329                   | 3.150930            | 2.900178  | 3.050994             | 3.068439            | 2.907542  | القيمة الحرجة (5%) |           |
| 3.004515                   | 4.225609            | 3.490025  | 1.904532             | 2.839210            | 1.342299  | t:(ADF)            |           |
| 0.0494                     | 0.0049              | 0.0030    | 0.8677               | 0.9151              | 0.9134    | Prob               | HT        |
| 2.850607                   | 3.140044            | 2.903274  | 2.035194             | 2.560059            | 2.003212  | القيمة الحرجة (5%) |           |
| 3.331115                   | 4.984432            | 3.089045  | 1.700891             | 2.039872            | 1.394312  | t:(ADF)            |           |

**Source:** Prepared by the researcher using Eviews software.

From the above table it is clear that all the study variables are not stationary at the first level because the value of the ADF statistic is smaller than the critical absolute value at a 5%

significance level for all the original series of the study variables. While all variables reached the stage of rest and stability after taking their first difference at a significance level of 5%, we conclude from this that all original series are stable and integrated of degree (1) I, and this indicates the presence of joint integration between the variables.

**Third - Cointegration Test:** Cointegration is the statistical meaning of the existence of a long-term relationship between economic variables. This test states that if the variables are integrated to the same degree each on its own, then the linear combination of these variables will also be integrated to the same degree. To test the vector of the relationship between the variables and the number of rays of the model, we conduct the Johannes cointegration test.

**Table 5: Johannes' Cointegration Test Results**

Date: 07/18/25 Time: 23:19  
Sample (adjusted): 2000 2023  
Included observations: 24after adjustments  
Trend assumption: Linear deterministic trend  
Series: DPIS DCI DCA DMD DHT  
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized<br>No. of CE(s) | Eigenvalue | Trace<br>Statistic | 0.05<br>Critical Value | Prob.** |
|------------------------------|------------|--------------------|------------------------|---------|
| None *                       | 0.526009   | 52.16678           | 39.80932               | 0.0201  |
| At most 1 *                  | 0.410081   | 51.09434           | 45.09471               | 0.0166  |
| At most 2 *                  | 0.247336   | 23.06833           | 18.49371               | 0.0394  |
| At most 3                    | 0.184980   | 3.06721            | 8.548860               | 0.2369  |
| At most 4                    | 0.179930   | 4.004178           | 5.841466               | 0.1847  |

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized<br>No. of CE(s) | Eigenvalue | Max-Eigen<br>Statistic | 0.05<br>Critical Value | Prob.** |
|------------------------------|------------|------------------------|------------------------|---------|
| None *                       | 0.526009   | 43.07079               | 37.50414               | 0.0171  |
| At most 1 *                  | 0.410081   | 28.70137               | 21.13162               | 0.0305  |
| At most 2 *                  | 0.247336   | 23.05411               | 17.26460               | 0.0206  |
| At most 3                    | 0.184980   | 4.909354               | 5.14126                | 0.2487  |
| At most 4                    | 0.179930   | 4.004178               | 5.841466               | 0.1847  |

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Source: Prepared by the researcher using Eviews software

The results of this test indicate the rejection of the null hypothesis, which states that there is no relationship for joint integration, because the value of the effect statistic for this



hypothesis is greater than the critical value of the test at a significance level of 5%, as the effect test shows that there is more than one relationship for joint integration between the variables ( $r+1$ ). The results of the maximum eigenvalue test also confirmed the rejection of the null hypothesis that states that there is no relationship for cointegration, because the maximum eigenvalue statistic for this hypothesis is greater than the critical value of the test at a significance level of 5%. Therefore, it is clear from the results of the impact and maximum eigenvalue tests that there is more than one long-term equilibrium relationship between the variables, and this in multiple directions. That is, these variables do not diverge much from each other in the long run, as they show similar behavior. Thus, there is a static linear combination between the dependent variable and its determinants.

#### **Fourth: Estimating the Error Correction Model (ECM):**

After ensuring that the series are stationary and that there are long-term cointegration relationships between the variables in the study model, an Error Correction Model (ECM) is estimated, which captures the short-term dynamics (short-term relationship) between the explanatory variables and the dependent variable. The presence of cointegration means the addition of an error correction term, which measures the speed of adjustment of short-term imbalances to long-term equilibrium. The error correction term represents the effect of the long-term causal relationship and is the result of the residuals of the long-term equilibrium model. From this, we can write the formula for the model as follows:

$$DPIB = C + b_1 DCA + b_2 DHT + b_3 DMD + b_4 CI + b_5 ECM(-1)$$

Where:  $ECM(-1)$  represents the error correction term in the last equation, and indicates the coefficient of adjustment speed from

the short term to the long term. The error correction model was estimated and the following results were obtained:

**Table 6: Error Correction Model Estimation Results**

| Dependent Variable: DPIB                    |             |                       |             |        |
|---------------------------------------------|-------------|-----------------------|-------------|--------|
| Method: Least Squares                       |             |                       |             |        |
| Date: 07/15/25 Time: 23:55                  |             |                       |             |        |
| Sample (adjusted): 2000 2023                |             |                       |             |        |
| Included observations: 24 after adjustments |             |                       |             |        |
| Variable                                    | Coefficient | Std. Error            | t-Statistic | Prob.  |
| DCA                                         | -0.199805   | 0.840921              | -0.361015   | 0.8021 |
| DHT                                         | -0.013899   | 0.064120              | -0.064419   | 0.6910 |
| DMD                                         | 0.061618    | 0.030081              | 0.361921    | 0.7010 |
| DCI                                         | 14.04720    | 9.329015              | 1.918703    | 0.1084 |
| E(-1)                                       | -0.770222   | 0.260674              | -5.069821   | 0.0030 |
| C                                           | -15.60122   | 11.04871              | 0.410061    | 0.5002 |
| R-squared                                   | 0.651370    | Mean dependent var    | 43.89446    |        |
| Adjusted R-squared                          | 0.449203    | S.D. dependent var    | 160.0652    |        |
| S.E. of regression                          | 87.49025    | Akaike info criterion | 8.43017     |        |
| Sum squared resid                           | 91.70431    | Schwarz criterion     | 8.67031     |        |
| Log likelihood                              | -79.71842   | Hannan-Quinn criter.  | 8.52008     |        |
| F-statistic                                 | 2.651370    | Durbin-Watson stat    | 1.87393     |        |
| Prob (F-statistic)                          | 0.000000    |                       |             |        |

Source: Prepared by the researcher using Eviews software

### Analysis of the results of the estimation of the model economically and quantitatively:

Before accepting the model to predict or analyze the phenomenon under study, it must be ensured that the model meets all statistical and economic standards. Starting from the coefficient of determination  $R^2$ , we find that the model explains 65.13%, while the remaining percentage is due to other factors and variables not included in this model. The error correction coefficient also appears with a negative sign (-0.77022). In addition, the probability associated with the Student statistic for this coefficient is less than 5%, and thus the error correction coefficient is negative and significant, which confirms the long-term relationship between the variables. The value of the error correction coefficient (-0.77022) indicates the speed of adjusting the imbalance, as the gross domestic product returns to long-term equilibrium by taking 77% of the adjustment annually.

We also conclude from the table above that the long-term results remain achieved in the short term, as all the independent



variables are acceptable from an economic point of view. As for the diversification index, it is significant and has a direct relationship with the gross domestic product. As for the relationship between human capital and the gross domestic product and the relationship between capital accumulation and the gross domestic product, it is inverse. Regarding the relationship between employment and GDP, it is directly proportional, and the elasticity signals came in accordance with the expectations of economic theory regarding the explanatory external variables, meaning that the model is acceptable from an economic perspective.

**Fifth - Autocorrelation test for residuals:** In order to detect autocorrelation of residuals, we rely on the (Breush-Godfrey Serial Correlation LM Tet) test, the results of which are shown in the following table:

**Table No. 7: Results of the LM test**

| Breush -Godfrey Serial Correlation LM Test |          |                     |        |
|--------------------------------------------|----------|---------------------|--------|
| F-statistic                                | 0.788640 | Prob. F(1,9)        | 0.5266 |
| Obs*R-squared                              | 3.704321 | Prob. Chi-Square(1) | 0.1617 |

**Source:** Prepared by the researcher using the Eviews program

**Sixth - Testing the non-constancy of error variance:** In order to know whether there is a correlation between the squares of the residuals or not, we resort to the “ARCH” test, where the null hypothesis states that the variance of the residuals is constant, and the alternative hypothesis states that the variance of the residuals is different. With the help of the Eviews program, we obtained the following results:

**Table 8: ARCH-LM test results for the model**

Heteroskedasticity Test: ARCH

|               |          |                     |        |
|---------------|----------|---------------------|--------|
| F-statistic   | 1.805431 | Prob. F(1,23)       | 0.4266 |
| Obs*R-squared | 3.675420 | Prob. Chi-Square(1) | 0.3617 |

**Source:** Prepared by the researcher using Eviews software

From the table above, we note that the probability of the test is greater than 0.05, which means accepting the hypothesis of stability of error variances, i.e., the conditional variance of errors is homogeneous.

### Conclusion:

It is clear from the above that the goal of achieving economic diversification in the Algerian economy is to expand the revenue base and stabilize economic growth, in addition to increasing the added value of each sector, given its importance under the current circumstances. The importance of diversifying the economic base is complemented by the fact that it is a necessary condition for building a sustainable economy based on a broad and diverse base of economic resources and characterised by a high degree of internal integration embodied in the close interconnection between its various sectors and activities.

In this regard, we find that Algeria has implemented a number of measures, policies and reforms in various sectors. However, despite this, these reforms have not achieved the desired results represented in the development of economic sectors independent of oil revenues. Therefore, in light of these current economic conditions,

the success of the trend towards economic diversification in Algeria requires strengthening sources of financing by developing alternative sources of income and increasing the contribution of alternative sectors, branches and activities to the national economy through new economic policies for horizontal



and vertical economic diversification, which develops forward and backward links between all sectors, thus contributing to the gradual elimination of the sole source of income for wealth. This is achieved by emulating the strategies of leading international experiences in the field of economic diversification and development leadership, which leads to the creation of a diverse economic base for comprehensive sustainable economic development.

The results of the model estimation also show that the relationship between the diversification index and economic growth is a positive relationship with statistical significance in the long run, but it is weak due to the lack of activation of the various sectors and their interconnectedness to contribute to the gross domestic product. The relationship between total capital accumulation and GDP is inverse, and the same applies to the relationship between human capital and GDP, which is inverse. As for the relationship between labor and GDP, it is direct, and this is consistent with economic theory.

### **Recommendations:**

- The need to benefit from the experiences of other countries regarding economic diversification policies, especially those with similar economic characteristics to the Algerian economy.
- Official state actors, primarily represented by Algerian economic diplomacy, must be involved, given their important role in supporting and promoting exports outside the hydrocarbon sector by promoting local products in international markets.
- Exploiting the fields and sectors in which Algeria has the qualifications and capabilities, by addressing all the problems, shortcomings and imbalances that hinder economic diversification in Algeria.

- Providing financial facilities, given that the main driver of local and foreign investments is the banking sector, which plays an effective role in supporting local and foreign investors.
- Focus on renewable energy, which is a vital sector on which the economies of major countries depend.

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