

Measuring and Analyzing Economic Diversification Using the Herfindahl-Hirschman Index

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Abstract:

This study aims to analyze and measure economic diversification using the Herfindahl-Hirschman Index (HHI), focusing on the Algerian economy from 2019 to 2023. A descriptive analytical approach was adopted to review previous studies and present the current state of diversification in the Algerian economy, alongside the policies and efforts undertaken by the government. The study revealed that the HHI values for the period from 2019 to 2023 ranged between 0.2 and 0.4, indicating a moderate level of economic diversification in Algeria, as the economy continues to move away from its dependence on the hydrocarbons sector. Additionally, the study calculated the commodity diversification index, which consistently showed values close to 1, indicating a lack of diversification in Algerian exports. The export capacity index was also calculated, with values ranging from 1.2% to 3.1%, reflecting the weak contribution of non-hydrocarbon exports. Consequently, it can be concluded that the Algerian government's policies, under the 2016-2030 vision to promote

economic diversification, have yet to yield tangible results, despite several years of implementation focused on boosting non-hydrocarbon sectors.

Keywords: Economic Diversification, Herfindahl-Hirschman Index, Algerian Economy, Sectoral Diversification, Commodity Exports.

JEL Classification: O11, O14, C43.

INTRODUCTION

Economic diversification is a fundamental component of economic policy, particularly for nations reliant on a single sector for income and growth. Countries that heavily depend on natural resources, such as hydrocarbons, are vulnerable to market volatility, price shocks, and external economic pressures. This makes diversification not only an economic necessity but also a strategic imperative. Algeria, with its over-reliance on the hydrocarbon sector, is a case in point. The country has been grappling with the challenge of reducing its economic dependency on oil and gas, which constitute a significant portion of its GDP, exports, and government revenues. Economic diversification, therefore, stands as a critical policy goal for achieving long-term economic stability and growth. This paper aims to analyze the state of economic diversification in Algeria, focusing on the application of the Herfindahl-Hirschman Index (HHI) as a tool to assess the concentration of economic activities and the progress made toward diversification.

Algeria's dependence on hydrocarbons has been a double-edged sword. While it has facilitated significant economic growth during periods of high oil prices, it has also rendered the economy vulnerable to external shocks. For instance, the sharp decline in oil prices in the mid-1980s and again in the 2010s had a severe impact on Algeria's fiscal stability and economic development, leading to budget deficits, inflation, and currency devaluation. The country's economic structure remains largely undiversified, with limited contribution from sectors like agriculture, manufacturing, and services. To address these challenges, the Algerian government has implemented several policies aimed at promoting economic diversification. These efforts include reforms to attract foreign direct investment (FDI), improve the business climate, and stimulate growth in non-hydrocarbon sectors.

The Herfindahl-Hirschman Index (HHI) is a widely used measure of market concentration and economic diversification. It calculates the level of concentration in a given economy by analyzing the distribution of economic activities across various sectors. A higher HHI score indicates a high level of concentration, suggesting that a few sectors dominate the economy, while a lower score implies a more diversified economic structure. In the context of Algeria, the HHI can be applied to assess the concentration of economic activities, particularly in relation to the hydrocarbon sector. This paper will use the HHI to evaluate the extent of diversification in Algeria's economy over the past few decades, with a focus on the period from 2017 to 2021.

Hypotheses and Objectives

This study is based on the following hypotheses:

- Algeria's economy remains highly concentrated in the hydrocarbon sector, despite various government initiatives aimed at promoting diversification.
- The Herfindahl-Hirschman Index (HHI) for Algeria will reflect a high degree of economic concentration, indicating limited success in diversification efforts.
- Significant structural reforms, increased investment in non-hydrocarbon sectors, and a reduction in the dependency on global oil prices are necessary for achieving sustainable economic diversification.

The objectives of this study are threefold:

- To assess the degree of economic diversification in Algeria using the Herfindahl-Hirschman Index.
- To analyze the success and limitations of Algeria's diversification policies, particularly in non-hydrocarbon sectors such as agriculture, manufacturing, and services.
- To provide policy recommendations based on the experiences of other resource-rich countries that have successfully diversified their economies .

LITERATURE REVIEW

Introduction to Economic Diversification

Economic diversification refers to the process by which an economy shifts away from reliance on a narrow range of sectors, typically natural resources, toward a broader spectrum of activities. This transition is essential for resource-dependent countries like Algeria, where oil and gas revenues have traditionally dominated the economic landscape. The concentration of wealth and resources in the hydrocarbon sector increases vulnerability to external shocks, particularly global price fluctuations. Economic diversification is therefore viewed as a strategy to promote sustainable growth and economic resilience (El-Okair, 2020). The central idea is to redistribute economic activities across a wider range of sectors, encouraging innovation and long-term stability.

Theoretical Framework of Economic Diversification

The theory of economic diversification is rooted in the assumption that countries can reduce risk and enhance economic stability by broadening their economic base. In resource-rich economies, such as Algeria's, reliance on oil and gas can hinder growth when global prices are unstable. Scholars like Sachs and Warner (1995) introduced the concept of the "resource curse," where countries overly reliant on resources experience stunted development in other economic sectors. Thus, a diversified economy becomes crucial for mitigating risks from external shocks, fostering innovation, and generating sustainable employment (Bache et al., 2019).

Central to the theoretical framework of diversification is the importance of macroeconomic stability, policy reform, human capital investment, and business environment improvements. According to studies on other oil-exporting nations, factors such as sound fiscal policies, investment in education, and the promotion of non-resource sectors are essential for successful diversification (Gelb & Grasmann, 2010). Countries that neglect these reforms, like Venezuela and Nigeria, remain exposed to market instability, inflation, and stagnant growth, exacerbating their reliance on a single sector (Ross, 2012).

Application of the Herfindahl-Hirschman Index (HHI) in Measuring Economic Diversification

In a recent study by Haoui Faiza and Hafsi Bounebao Yacine (2022) titled "Measuring and Analyzing the Impact of Economic Diversification on Economic Growth in Arab Oil-Exporting Countries," using panel data models for the period 2000-2020, the results indicated a weak level of economic diversification in the countries included in the sample, except for the United Arab Emirates, which showed positive outcomes. The study also demonstrated that oil revenues and the level of economic diversification have a significant positive impact on economic growth.

Another study by Nasir Abdullah and Abdelhamid Hafid (2022) on the determinants of economic diversification in some Arab countries during the period 2000-2019 found that fixed capital formation and exchange rates are among the most important determinants of economic diversification in the Arab countries studied. Meanwhile, other variables, such as per capita GDP and trade openness, were not significant determinants of economic diversification.

In an International Monetary Fund (IMF) report (2016) on economic diversification in Arab oil-exporting countries, it was found that these countries face a triple challenge: creating jobs, managing macroeconomic volatility due to oil price fluctuations, and dealing with the depletion of oil resources. The study also revealed that the oil sector creates few direct jobs, with the public sector absorbing the majority of employment. Furthermore, it concluded that achieving economic diversification requires these countries to continue enhancing macroeconomic stability and improving regulatory and institutional frameworks.

In a study by Martin Hvidt (2013) titled "Economic Diversification in the Gulf Cooperation Council (GCC) Countries: Future Trends," the focus was on the future trends of economic diversification efforts within the current development plans and national visions of GCC countries. The study highlighted the weak level of economic diversification in previous years and emphasized the need to revitalize the private sector and implement broad reforms. It also identified several structural challenges hindering economic diversification.

The Herfindahl-Hirschman Index (HHI) is commonly used to evaluate market concentration and can effectively measure the extent of economic diversification. The HHI measures the square of market shares for firms or sectors, providing a summary measure of how concentrated or diversified an economy is. A higher HHI score suggests a concentrated economy, while a lower score signals diversification (Ghazali et al., 2022).

In the Algerian context, the HHI has been applied to assess sectoral concentration, particularly the dominance of the oil and gas sector. Studies like those by Ghedier and Kiheli (2022) show that despite government policies aimed at diversification, Algeria's HHI remains relatively high, underscoring the limited success of diversification efforts. The

persistence of a high HHI demonstrates the country's ongoing dependence on hydrocarbons, highlighting the challenges to creating a more balanced economic structure.

The study by Arabe (2021) examined the state of economic diversification in Algeria between 2001 and 2019, emphasizing the overwhelming dominance of the hydrocarbon sector in both the contribution to the country's GDP and overall exports and revenues. Using the Herfindahl-Hirschman Index (HHI) to quantify the level of economic diversification, the study found that Algeria's economy remains heavily reliant on hydrocarbons due to the limited diversification in exports and income sources. To address this issue, Arabe recommended shifting economic policies to focus more on non-hydrocarbon sectors, particularly by investing in agricultural development as a sustainable alternative.

Similarly, Daif and Azouz (2018) analyzed the mechanisms for activating economic diversification in Algeria, assessing the economic policies implemented since the 1986 oil crisis. Their research highlighted how the country's reliance on the oil sector, driven by its comparative advantage in global markets, has persisted. However, they pointed out Algeria's untapped potential in sectors such as agriculture, industry, and tourism. They also identified several barriers to the government's economic diversification programs, concluding that diversification remains weak based on the HHI, with the oil sector's dominance still closely tied to international oil price fluctuations. Among their recommendations were revising agricultural strategies, drawing on global experiences in combating corruption, and encouraging private-sector investment.

Prior to these, Brahji and Chemmam (2017) explored the role of economic policies adopted by Algeria from 2000 to 2014 in promoting sustainable development, with a particular focus on achieving economic diversification. Using a composite Herfindahl-Hirschman Index to estimate the degree of diversification and structural transformation, they analyzed key indicators of sustainable development across economic, social, and environmental dimensions. Their findings showed a significant decline in Algeria's economic diversification during the period, largely attributed to weakening variables in the index. This failure to achieve diversification, they argued, posed a challenge to sustainability indicators.

These studies collectively highlight the long-term nature of Algeria's efforts toward economic diversification, which have often coincided with periods of recovery in the oil market. Each resurgence in oil prices has provided Algeria with substantial financial windfalls, which have been used to finance its annual budgets. Despite the creation of a sovereign wealth fund to manage surplus revenues, recent economic crises have exposed the fragility of Algeria's savings in this fund. Furthermore, when Algeria initiated a two-phase program aimed at achieving economic stability, the global health crisis derailed these plans. The collapse in oil prices to critical levels compounded the challenges, forcing the government to adopt urgent measures to accelerate economic transformation and diversification. This study aims to analyze Algeria's current economic state during the period marked by the implementation of the new economic model, which was interrupted by the pandemic, suggesting that parallel efforts were needed for a more immediate shift toward diversification.

Algeria's Economic Diversification Efforts

Over the past few decades, Algeria has made multiple attempts to diversify its economy, particularly after the oil price shocks of the 1980s and 2010s. The Algerian government initiated reforms to encourage foreign direct investment (FDI), promote entrepreneurship, and strengthen non-hydrocarbon sectors such as agriculture, manufacturing, and services. However, the progress has been slow, with the hydrocarbon sector still accounting for a large share of national revenues and exports (International Monetary Fund [IMF], 2016).

One of the critical weaknesses of Algeria's diversification efforts lies in the non-hydrocarbon sectors' underdevelopment. The agricultural sector, for instance, suffers from low productivity and limited access to advanced technologies. Similarly, manufacturing remains small and non-competitive on an international scale. While there have been government initiatives to stimulate entrepreneurship and the development of small and medium-sized enterprises (SMEs), structural barriers continue to impede progress (Benachenhou, 2019).

One promising area is renewable energy, particularly solar power. The Algerian government has committed to investing in this sector as part of its long-term energy strategy. By focusing on renewable energy, Algeria aims to reduce its dependence on hydrocarbons and create jobs in new industries. However, significant challenges remain in terms of infrastructure, policy coherence, and investment (El Amrani, 2019).

Comparative Analysis: Economic Diversification in Other Oil-Exporting Countries

The experiences of other oil-exporting countries provide critical insights into Algeria's diversification efforts. Countries like Norway, Saudi Arabia, and the United Arab Emirates have made significant progress in reducing their reliance on oil revenues through long-term planning and comprehensive reforms. For example, Norway's sovereign wealth fund, which invests oil revenues in diverse global assets, has helped shield the country from oil price volatility. Meanwhile, Saudi Arabia's Vision 2030 and the UAE's economic reform programs emphasize the development of industries such as tourism, manufacturing, and finance, showcasing effective models for diversification (Fasano-Filho, 2012).

In contrast, Venezuela and Nigeria have struggled with diversification due to political instability, governance issues, and insufficient structural reforms. These countries remain heavily reliant on oil, which has led to economic instability and slow growth. The challenges faced by these nations highlight the importance of implementing robust, long-term reforms for successful diversification (Karl, 2007).

Challenges and Prospects for Algeria

Algeria faces several challenges in its diversification journey. Structural weaknesses, including bureaucratic inefficiencies, corruption, and the dominance of state-owned enterprises, have hindered private sector growth. Moreover, labor market rigidities and a lack of skilled labor continue to be significant obstacles. According to the World Bank (2021), Algeria needs to overhaul its education system and improve vocational training to provide the workforce with the skills necessary to compete in a diversified economy.

On the positive side, Algeria's geographic location offers a strategic advantage. Situated between Europe, Africa, and the Middle East, Algeria can potentially become a regional hub for trade and investment. The country also has significant renewable energy potential, particularly in solar energy, which could play a crucial role in its diversification efforts (Ben Ali, 2018).

Lessons from Other Oil-Exporting Countries

The lessons from countries like Norway and Saudi Arabia suggest that economic diversification requires sustained political will, sound macroeconomic policies, and substantial investment in human capital and innovation. These countries have demonstrated that successful diversification involves more than just policy changes; it requires a cultural shift towards fostering entrepreneurship and encouraging competition across sectors (Gelb et al., 2014). For Algeria, replicating these successful models may involve deep structural reforms, including enhancing governance and fostering a more dynamic private sector.

METHODOLOGY

Several indicators can help assess the degree of economic diversification in any country, including:

- Rate and Degree of Structural Change: This is reflected by the percentage contribution of various sectors to the Gross Domestic Product (GDP) and the increase or decrease in their contributions over time. Tracking the real GDP growth rates by sector, where data is available, is also useful for this analysis. A shift in the sectoral composition of GDP points to the progress or lack thereof in structural economic transformation.

- GDP Volatility and Its Relationship to Oil Price Fluctuations: Economic diversification is expected to reduce GDP volatility, particularly in oil-exporting nations. A key objective of diversification is to shield the economy from the instability caused by fluctuating oil prices.

- Oil and Gas Revenue as a Share of Total Government Revenue: Another critical indicator is the share of oil and gas revenues in total government income. One of the goals of diversification is to decrease dependency on oil revenues, so monitoring the growth of non-oil revenues over time is a clear sign of success. An increase in the share of non-oil revenues suggests progress toward diversification.

- Non-Oil Exports as a Share of Total Exports: The share of non-oil exports in the total export basket is another significant metric. While short-term fluctuations in this metric may result from variations in oil prices, a sustained increase in non-oil exports is a positive sign of economic diversification.

- Sectoral Employment Trends: Employment distribution across sectors should also evolve in tandem with structural changes in GDP. An increase in employment in sectors beyond oil and gas would indicate a broader base of economic activity, contributing to sustainability and resilience.

- Relative Contributions of the Public and Private Sectors to GDP: Economic diversification often implies a growing role for the private sector in the overall economy. Therefore, tracking the private sector's increasing contribution to GDP is crucial for assessing progress in diversification.

- Productivity Measures: Productivity indicators, particularly in private-sector activities, can assess the rate of growth and modernization in diversified sectors.

While these indicators provide valuable insights into the degree of economic diversification, they do not offer a precise measurement of diversification due to the varied nature of the metrics used. To conduct cross-country or longitudinal

analyses, a single, reliable measure is needed. One of the most commonly used metrics for this purpose is the Herfindahl-Hirschman Index (HHI), which is widely regarded as an effective tool for measuring economic concentration and diversification.

The Herfindahl-Hirschman Index (HHI):

The Herfindahl-Hirschman Index (HHI) is a well-established metric that takes into account the entire distribution of industrial activity. It measures concentration by calculating the sum of the squares of the market shares of different sectors or firms within an industry. The index is particularly useful for determining how concentrated or diversified an economy is by evaluating the degree to which a country's exports rely on a narrow range of goods.

Herfindahl-Hirschman Index (HHI) for Measuring Economic Diversification:

The Herfindahl-Hirschman Index (HHI) is a widely recognized quantitative tool used to evaluate the concentration or diversification across various economic sectors. In the context of economic diversification, the HHI measures the proportion of a country's Gross Domestic Product (GDP) contributed by different sectors. This index provides critical insights into how evenly or unevenly economic activities are distributed across an economy.

The HHI formula is expressed as:

$$HHI = \sqrt{\sum_i^n S_i^2}$$

Where:

S_i : represents the share of GDP contributed by sector i ,

n : is the total number of economic sectors.

In economic analysis, a lower HHI value signifies a higher degree of diversification, which indicates that the economy's output is more evenly spread across multiple sectors. Conversely, a higher HHI value reflects economic concentration, where a few sectors dominate. This makes HHI a crucial tool for assessing economic resilience, particularly in economies aiming to diversify and reduce dependency on volatile sectors like oil and gas (Rhoades, 1993; Moon et al., 2014).

Interpreting Herfindahl-Hirschman Index (HHI) Results:

The interpretation of HHI values provides insights into the level of sectoral concentration or diversification in an economy.

- HHI Values Between 0.81–1.00 (High Concentration):

This range indicates a high concentration of economic activity within a few sectors. Economies in this category are typically highly dependent on specific industries, making them vulnerable to sector-specific risks such as price fluctuations or demand shifts. For instance, countries heavily reliant on the oil industry tend to have HHI values approaching 1, reflecting a significant concentration of economic output in that sector (Zheng, 2021).

- HHI Values Between 0.61–0.80 (Medium-High Concentration):

This range reflects economies that still exhibit significant concentration but are beginning to show some diversification. Although a few sectors dominate, others contribute enough to reduce the overall concentration slightly. Economies in this range may be transitioning from dependence on one or two key sectors toward more diversified structures (Kim et al., 2018).

- HHI Values Between 0.41–0.60 (Medium Concentration):

This level indicates a moderately diversified economic structure. While a few sectors may still have a substantial share of the economy, other sectors are becoming more important. Economies in this range can better mitigate risks from sector-specific shocks, though they remain somewhat vulnerable (Gambardella & Torrisi, 1998).

- HHI Values Between 0.21–0.40 (Medium-High Decentralization):

This range reflects a decentralized economy with significant diversification. Such economies are less reliant on any single sector, which reduces the overall risk of shocks in individual industries. Countries in this range generally exhibit greater economic stability, with the ability to absorb disruptions in one or more sectors without severe consequences (Lu et al., 2017).

- HHI Values Between 0.01–0.20 (High Decentralization):

Economies with HHI values in this range are highly diversified, with no single sector dominating the economic landscape. This indicates a well-balanced distribution of economic activity, contributing to greater resilience against external shocks. These economies are better equipped to withstand disruptions in any sector due to the broad distribution of economic activities (Susilo & Axhausen, 2014).

Previous studies have also introduced variants of the HHI, such as 1-HHI, to enhance the understanding of diversification levels. A higher 1-HHI value signifies greater industrial diversification. For instance, Moon et al. (2014) used 1-HHI to measure the correlation between industrial diversification and regional economic growth. Similarly, Zheng (2021) employed 1/HHI to analyze industrial agglomeration, where higher values indicated more diversified industrial structures.

In conclusion, the HHI, along with its variants such as 1-HHI or 1/HHI, offers valuable insights into the level of concentration or diversification in an economy. Lower HHI values suggest a more stable and resilient economy due to a broader distribution of activities across sectors, while higher values point to increased vulnerability stemming from economic concentration.

In the context of Algeria, the HHI will be used to measure the degree of economic diversification. A high HHI would suggest that the Algerian economy remains heavily dependent on hydrocarbons, while a lower HHI would indicate progress toward diversification, with various sectors contributing more evenly to GDP.

RESULTS

Sectoral Diversification: To understand and analyze sectoral diversification, we focus on the most important economic sectors, including the hydrocarbons sector, agriculture, industry, construction and public works, transport and communications, and the trade and vehicle repair sector, as categorized in the Bank of Algeria's bulletin. This analysis covers the period from 2019 to 2023. As shown in Table (1), the table reveals the following:

Table 01: Contribution of Economic Sectors to GDP for the Period 2019-2023 (unit: billion DZD)

Transport and Communications	Trade and Auto Repair	Construction and Public Works	Industry	Agriculture	Fuel	years
3022,9	2584,9	3151,1	1478,7	2589,8	2766	2019
2690,6	2427,6	3058,7	1313,2	2619,8	1542,6	2020
2838,6	2741,3	3441,5	2060,1	2759,2	3260,5	2021
3001,4	3165,1	3843,6	3283,8	3323,1	6278,3	2022
3123,3	3541,3	4206,9	2533,8	4204,4	5237,2	2023

Source: Prepared by researchers based on the Bank of Algeria report for the year 2023, available on the website <https://www.bank-of-algeria.dz/>

Decline in the Contribution of the Hydrocarbons Sector to GDP: The contribution of the hydrocarbons sector to GDP decreased from DZD 2766 billion in 2019 to DZD 1,542.6 billion in 2020, due to the decline in global oil prices. However, it rebounded in 2021, reaching DZD 3260.5 billion, following the recovery of global oil prices. This indicates that Algeria's hydrocarbons sector is closely tied to external oil price fluctuations, eventually reaching DZD 5237.2 billion by the end of 2023.

The industrial sector also experienced slight growth, with its contribution increasing from DZD 1478.7 billion in 2019 to DZD 2533.8 billion in 2023. This growth is attributed to the political and economic policies adopted by the state, as well as the impact of the COVID-19 crisis on Algeria's economy.

The agriculture sector witnessed a slight increase in its contribution to GDP, rising from DZD 2589.8 billion in 2019 to DZD 4204.4 billion in 2023. This increase is due to higher investments in the sector and enhanced support for most agricultural branches, reflecting the government's strategy of relying on agriculture as a strategic alternative to hydrocarbons.

The construction and public works sector also showed slight improvement, with its contribution increasing from DZD 3151.1 billion in 2019 to DZD 4206.9 billion in 2023. This growth is attributed to the sector benefiting from the implementation of the economic recovery support policy.

In contrast, the trade and vehicle repair sector saw a decline in its contribution from DZD 2584.9 billion in 2019 to DZD 2427.6 billion in 2020, following continuous growth until 2019. This decrease was due to the economic repercussions of the COVID-19 crisis. However, the sector recovered, reaching DZD 3541.3 billion by 2023.

The transport and telecommunications sector also experienced growth during the 2019-2023 period, with its contribution rising from DZD 3022.9 billion in 2019 to DZD 3123.3 billion by the end of 2023.

To assess sectoral diversification, the Herfindahl-Hirschman Index (HHI) was calculated for the 2019-2023 period, as shown in Table 2. Since all HHI values are between 0.2 and 0.4, this indicates that Algeria's economy is diversified across various sectors. It also demonstrates that Algeria continues its efforts to reduce its reliance on the hydrocarbons sector.

Table 02: Herfindahl-Hirschman Index for Sectoral Diversification of GDP-Contributing Sectors in Algeria during the Period 2019-2023

Herfindahl-Hirschman Index	years
0,281651	2019
0,276723	2020
0,2808	2021
0,304386	2022

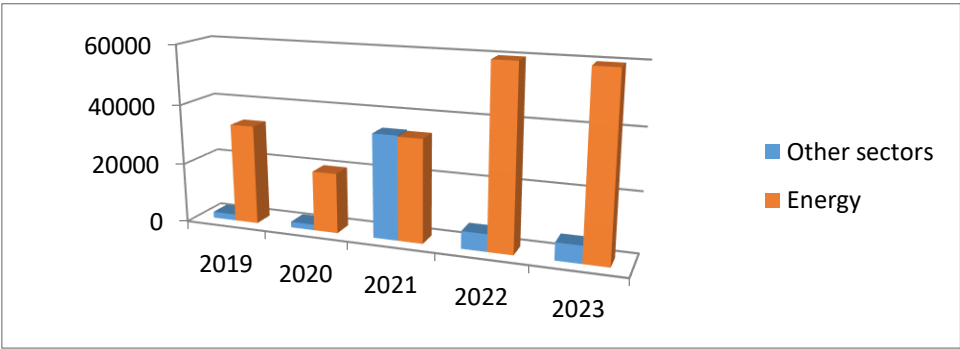
Source: Prepared by researchers based on data from Table 01

Export Diversification:

Export diversification refers primarily to the expansion of export categories, not only by supplying foreign markets with raw materials but also with processed, transformed, and manufactured products, as well as semi-finished goods from local production (Karim, 2020, p. 250). There is a strong relationship between sectoral diversification and export diversification. For any economy to diversify, changes in the production apparatus must also be accompanied by changes in the export structure. To measure export diversification, we will analyze the following components: hydrocarbons, foodstuffs, raw materials, semi-manufactured goods, agricultural equipment, industrial equipment, and consumer goods over the period (2019-2023).

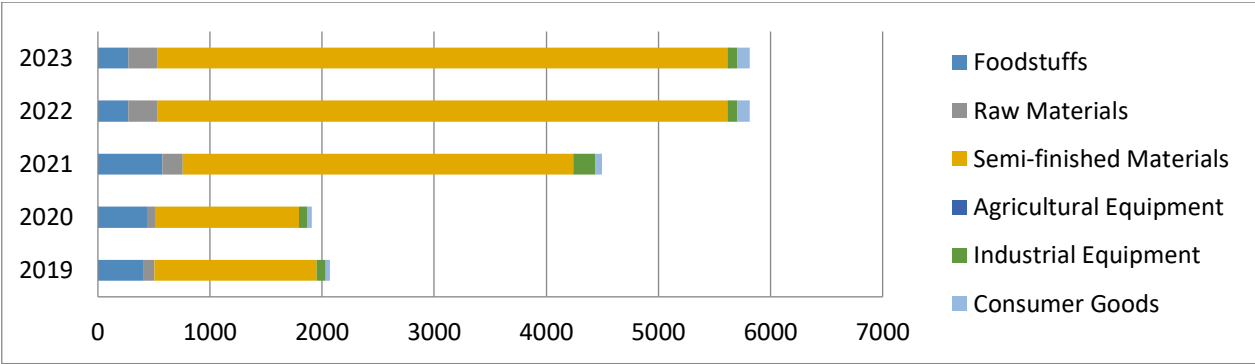
As shown in Figure (1&2), Algerian exports are dominated by oil exports, which accounted for approximately 95%. This percentage slightly decreased in 2020, with hydrocarbons contributing about 91%, and it reached its peak in 2022 at DZD 59900 billion. However, a gradual decline followed, bringing the figure to DZD 59711 billion by 2023. As for non-hydrocarbon exports, they contribute a very small share of national exports, fluctuating between 11.66% in 2021 (Bank of Algeria, 2021, p. 28). Despite the state's efforts to promote non-hydrocarbon exports and its strategy to support economic diversification through the new economic growth strategy, which began in 2016, the share remains limited.

Figure 01: Evolution of the Contribution of the Hydrocarbons Sector to Algerian Exports (unit: billion DZD)



Source: Prepared by researchers based on the Bank of Algeria report for the year 2023, available on the website <https://www.bank-of-algeria.dz/>

Figure 02: Evolution of the Contribution of Non-Hydrocarbon Sectors to Algerian Exports (unit: billion DZD)



Source: Prepared by researchers based on the Bank of Algeria report for the year 2023, available on the website <https://www.bank-of-algeria.dz/>

To assess the extent of Algeria’s export diversification, we will analyze the Commodity Diversification Index, which measures the deviation of a country’s main export commodities’ share in its total exports from the global share of those commodities in world exports. The index ranges between 0 and 1, with values closer to 0 indicating a higher degree of export diversification. When the index reaches 0, the structure of national exports aligns with the structure of global exports (Unified Arab Economic Report 2010). The index is calculated using the following formula:

$$S_j = \frac{\sum_i |h_{ij} - h_j|}{2}$$

It is given by the following formula, where:

h_{ij} : represents the share of product i in the total exports of the country.

h_j : represents the share of product j in total global exports.

Table (3) shows the evolution of the Commodity Diversification Index value over the period 2019-2023.

2023	2022	2021	2020	2019	
0.791	0.774	0.814	0.828	0.805	Value
133	121	118	121	125	Number of goods exported

Source: Prepared by researchers based on the UNCTAD database available on the website <https://unctadstat.unctad.org/>

From the previous table, we can observe that throughout the study period, the index values were consistently close to 1, indicating that Algeria's exports lack commodity diversification. This is evident from the limited number of exported goods. The best index values were recorded in 2022 and 2023, with scores of 0.774 and 0.791, respectively, while the number of exported goods ranged between 121 and 133. The highest number of exported goods was also recorded in 2022 and 2023, confirming that Algeria's export structure is far from the diversified global export structure, which consists of 260 exported goods.

In addition to the above, we calculate the export capacity index, which represents the contribution of non-hydrocarbon exports to the formation of the country's Gross Domestic Product (GDP). It is calculated as the ratio of non-hydrocarbon exports to GDP. The higher the ratio, the better the country's reliance on external markets to form its GDP. This ratio should also be compared with the hydrocarbon export capacity index and its ability to cover imports. The formula is given as follows:

$$Xi = \frac{\text{Non - hydrocarbon exports}}{\text{GDP}} * 100$$

Where:

Xi : Export Capacity Index

Table 04 shows the evolution of Algeria's Export Capacity Index for the period 2019-2023.

Unit (million dollars)

2019	2020	2021	2022	2023	
171760	145744	163473	191913	205621	GDP
2079	1916	4579	5980	5978	Non - hydrocarbon exports
1,2	1,3	2,8	3,1	2,9	<i>Xi</i>

Source: Prepared by researchers based on the UNCTAD database available on the website <https://unctadstat.unctad.org/>

From Table 04, we observe that the Export Capacity Index recorded low levels, ranging between 1.2% and 3.1%, reflecting the weakness of the non-hydrocarbon export sector. In 2019 and 2023, the index values were 1.2% and 2.9%, respectively, indicating that the total contribution of Algeria's non-hydrocarbon exports to GDP formation was only 2.9%. This highlights the low competitiveness of Algeria's non-hydrocarbon exports. The highest value recorded was 3.1% in 2022. Thus, the competitiveness of non-hydrocarbon exports remains weak and falls short of expectations according to the Export Capacity Index. The country relies on other sectors, both domestic and foreign, to form its GDP.

Despite the efforts made by the Algerian government to shift away from a rent-based economy and diversify its economy, including the adoption of various policies and strategies aimed at reducing dependence on the oil sector, these efforts have faced numerous shortcomings and criticisms. The New Economic Growth Program (2016-2030) is an example, criticized for its lack of clear objectives and vision.

Analyzing Algeria's economic diversification through the Herfindahl-Hirschman Index for the period (2019-2021), using two variables—sectoral diversification and export diversification—we found that Algeria suffers from a lack of diversification in its economy. The hydrocarbons sector remains dominant in terms of production, exports, and its

contribution to GDP. As a result, economic growth rates are tied to the performance of this sector, which is highly vulnerable to price fluctuations in international markets, reinforcing the rentier nature of the Algerian economy.

DISCUSSION

The Reality of Economic Diversification in Algeria:

Algeria's economy remains heavily reliant on hydrocarbons, contributing over 90% of its exports. Although efforts have been made to diversify the economy, significant structural challenges persist. The country's non-hydrocarbon sectors, including agriculture, manufacturing, and services, still play a marginal role in terms of export revenues and overall economic output.

The lack of diversification makes Algeria vulnerable to fluctuations in global oil prices, which has historically led to economic instability. Efforts such as the New Economic Growth Program (2016-2030) aimed at shifting the economy towards other sectors have seen limited success due to a combination of regulatory, financial, and infrastructural barriers.

Mechanisms to Enhance Economic Diversification:

Several mechanisms can be implemented to bolster Algeria's economic diversification, focusing on stimulating growth in non-hydrocarbon sectors and making the private sector more competitive.

- Development of Value-Added Industries: Algeria must expand its manufacturing capabilities to produce higher value-added goods, especially in industries such as food processing and light manufacturing. This would reduce dependency on raw material exports and increase export competitiveness.
- Promoting Agriculture as an Alternative: The agricultural sector holds significant potential to contribute to economic diversification. By modernizing agricultural techniques and infrastructure, Algeria could significantly boost productivity and exports, reducing reliance on imports for essential foodstuffs. : (Lashitew et al., 2021)
- Improving Infrastructure and Logistics: Developing infrastructure such as transport networks and port facilities will reduce bottlenecks for industries, enhancing the efficiency and export potential of non-hydrocarbon sectors.
- Encouraging Public-Private Partnerships (PPPs): Collaborations between the public sector and private enterprises can accelerate development in sectors such as renewable energy, manufacturing, and technology. PPPs can provide much-needed investment capital, expertise, and management capabilities.
- Strengthening Export Promotion Programs: By enhancing the capabilities of non-hydrocarbon sectors to access regional and global markets, Algeria can diversify its export portfolio. Policies focusing on export incentives and reducing trade barriers will play a crucial role.

Challenges Faced by the Private Sector:

Algeria's private sector is underdeveloped due to a variety of factors, many of which are regulatory or infrastructural. Key challenges include:

- Bureaucratic Hurdles: Complex administrative processes make it difficult for businesses to operate efficiently, especially for small and medium-sized enterprises (SMEs). The regulatory environment is often seen as a barrier to entrepreneurship.
- Limited Access to Finance: Despite efforts to stimulate private sector growth, access to finance remains limited, particularly for SMEs. The banking system in Algeria is heavily centralized and favors state-run enterprises.
- Inadequate Infrastructure: While public infrastructure projects have been prioritized, the industrial and logistical infrastructure needed to support private sector growth remains insufficient. This stifles the competitiveness of sectors outside hydrocarbons.
- Overdependence on Hydrocarbons: The government's dependence on hydrocarbons for fiscal revenue limits its ability to invest in other sectors. This reliance creates a cycle of dependency that hinders the development of the private sector (Sabah, 2024).

Proposed Solutions for Non-Hydrocarbon Growth:

To activate the non-hydrocarbon sectors and achieve sustained economic growth, Algeria must implement comprehensive reforms and strategic initiatives:

- Simplifying Regulations: Reducing red tape and creating a more transparent business environment will encourage private investment. Simplified regulations, particularly for SMEs, would help stimulate growth in manufacturing, services, and agriculture.

- Improving Access to Finance: Reforming the banking sector to improve access to credit for private enterprises is essential. The development of microfinance institutions could also be beneficial for supporting startups and smaller businesses. : (Jolo et al., 2022).

- Enhancing Skills and Human Capital: Investments in education and vocational training tailored to the needs of the growing non-hydrocarbon sectors will ensure that the workforce is equipped to support diversification. Promoting innovation and entrepreneurship through training programs can also stimulate growth.

- Boosting Exports through Free Trade Zones: Establishing special economic zones with tax incentives and reduced bureaucratic hurdles can attract foreign investment and boost export-oriented industries.

CONCLUSIONS

Algeria's path toward economic diversification has been gradual, with significant challenges tied to the dominance of the hydrocarbons sector. While hydrocarbons remain a critical part of the economy, it is essential for Algeria to reduce its reliance on this volatile sector and pursue sustained growth through the development of other industries. The country's initiatives, such as the New Economic Growth Program (2016-2030), signal an awareness of the need for diversification. However, there are several barriers, including limited infrastructure, a bureaucratic business environment, and inadequate access to financing, which must be addressed to foster a more resilient economy.

Recommendations

To accelerate economic diversification and achieve long-term sustainable development, Algeria should adopt the following strategic measures:

-Infrastructure Development: Modernizing transport, ports, and communication infrastructure is essential to improving the efficiency of non-hydrocarbon sectors. This includes the creation of industrial zones and special economic zones that offer tax incentives and support for industries such as agriculture and manufacturing.

- Fostering Public-Private Partnerships: Encourage stronger collaboration between the public and private sectors, particularly in infrastructure development, technology, and manufacturing. These partnerships can drive innovation, increase productivity, and attract foreign investment.

- Strengthening the Private Sector: Simplifying the regulatory environment to make it easier for small and medium-sized enterprises (SMEs) to operate is critical. Streamlining administrative procedures, improving access to financing, and supporting entrepreneurial initiatives are key to stimulating economic activity in non-hydrocarbon sectors.

- Enhancing Human Capital: Investing in education, vocational training, and research is vital for the growth of value-added industries. Algeria must develop its workforce to meet the demands of diversified industries, particularly in technology and manufacturing.

- Boosting Non-Hydrocarbon Exports: Expanding export capabilities in agriculture, manufacturing, and services is crucial for reducing Algeria's dependence on oil and gas. By entering new regional and global markets, Algeria can increase the share of non-hydrocarbon goods in its export portfolio, providing a buffer against oil price shocks.

- Promoting Renewable Energy: As part of its long-term strategy, Algeria should also focus on developing sustainable energy sources. This will not only contribute to environmental goals but also position Algeria as a leader in the renewable energy market.

- Attracting Foreign Direct Investment (FDI): Improving the investment climate by reducing bureaucratic obstacles and offering incentives for foreign investors can enhance the country's global competitiveness, particularly in sectors like renewable energy, agriculture, and manufacturing.

By implementing these strategies, Algeria can effectively diversify its economy, reduce its dependency on hydrocarbons, and achieve sustainable growth. The focus must be on fostering a more dynamic private sector, enhancing export competitiveness, and investing in the development of critical infrastructure.

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