



The impact of liberalizing foreign trade on the economic diversification of the Maghreb countries Algeria, Tunisia, and Morocco

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Abstract :

While economic diversification is crucial for economic development in most countries, it remains a challenge for some low- and middle-income developing nations, as well as for small and non-touristic economies. This research paper assesses the current state of economic diversification in the Arab Maghreb countries, including Algeria (the leading state), which has adopted various strategies to boost its economic diversification across different sectors. The aim is to understand the role of foreign trade liberalization adopted by the Maghreb countries in economic diversification and the extent of its impact on their economic development, positioning them among developed nations. To achieve this, we will examine the economics of these countries, particularly Algeria, to illustrate the close link between foreign trade and the economic development performance of these nations

Key Words: Economic Diversification – Determinants Of Economic Diversification – Foreign Trade Liberalization – Economy Of Maghreb Countries.

JEL Classification : R12 ; P45, F41

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Introduction

Foreign trade plays a crucial role in unlocking countries' economies by supplying non-domestic goods and services through imports, while simultaneously aiding in the disposal of surpluses of various goods and services through exports. Export diversification stands as a vital component within economic development mechanisms. This diversification is largely credited to trade liberalization agreements spanning the past five decades, which have consequently bolstered trade volumes and expanded global trade. However, the process of economic diversification remains a challenge, notably for countries reliant on a single resource such as oil & gas, as it is the case in Algeria, and for Arab Maghreb countries with economies restricted to specific sectors.

Problem statement: Our study centers on the primary question:

What is the effect of foreign trade liberalization on economic diversification within the Arab Maghreb countries?

From this question, we derive the following sub-questions:



- Can trade liberalization create new opportunities for economic diversification in the Arab Maghreb countries?
- Despite its challenges, is there potential for diversifying the Algerian economy?
- What are the major positive and negative impacts of foreign trade liberalization policies in the Arab Maghreb countries?

Study methodology: In this study, we employed two methodologies to address our research objectives. Firstly, we used a descriptive approach to showcase and analyze trade liberalization and the progression of foreign trade within the Arab Maghreb countries, focusing notably on Algeria. Secondly, we adopted an experimental approach based on a set of variables to establish the correlation between indicators of foreign trade liberalization and economic diversification in the Arab Maghreb countries. Our empirical study used regression analysis as a key analytical tool.

Study scope:

- Geographical scope: Arab Maghreb countries represented by Algeria, Tunisia and Morocco.
- Temporal frame: From 2002 to the end of 2022.
- The use of the panel data approach to measure the impact

Study objectives: The primary objective of this research is to explore and comprehend the connection between economic diversification and foreign trade liberalization in the Arab Maghreb countries. This will be achieved by interpreting and explaining specific economic diversification drivers as well as independent and dependent variables, including exchange rates, gross domestic product (GDP), and various exports. Additionally, the study aims to analyze the trade balance and diversification index, to further understand the relationship between economic diversification and a set of explanatory variables of foreign trade liberalization. Moreover, this paper delves into the economic development status of the Arab Maghreb countries, with a specific focus on Algeria.

The significance of the study lies in the necessity to comprehend and analyze the impact of foreign trade liberalization in Algeria, Tunisia, and Morocco, and to what extent it has addressed the inefficiencies facing the foreign trade sector in particular, and the economies of these countries in general.

I. Theoretical background:

1. Overview of the liberalization of foreign trade:

The liberalization of foreign trade has provided the Arab Maghreb countries, including Algeria, with the opportunity to achieve economic development and diversification. Foreign trade has emerged as a fundamental element in economic strategy. Governments can use their authority in trade transactions to meet political and economic objectives or to pursue economic goals such as shielding competitive emerging industries from monopolies or maintaining national production for the domestic market. Therefore, foreign trade possesses a dual nature: it responds to



external circumstances and factors while playing a significant role in the domestic economy. (Kheirja H, March 2023, p. 249) .

Trade liberalization is viewed as a measure to boost trade and liberate markets from restrictions and bureaucratic hurdles, thereby fostering economic growth and trade facilitation.

Foreign trade liberalization policy can be defined as a set of measures and actions aimed at transitioning the foreign trade system toward neutrality, where the government refrains from preferentially intervening in favor of imports or exports. The process itself necessitates substantial time and effort.(Qadi A, 2006, p. 249).

Trade liberalization seeks to bolster free trade, enabling countries to exchange goods without regulatory barriers or associated costs, while also reducing expenses for countries engaging in trade with others. This reduction can ultimately lead to lower consumer prices through reduced import duties and heightened competition (Caroline B, 2022, link).

One of Algeria's objectives with foreign trade liberalization is to enhance the volume and value of non-oil exports by diversifying export products and forging new trade opportunities with international markets through increased openness with other countries.

Trade openness is defined as a policy that eliminates biased policies against exports, adopts neutral policies between exports and imports, reduces high tariff values, converts quantitative restrictions into tariffs, and moves towards a unified customs pricing system. Consequently, the content of the trade liberalization program includes numerous measures related to import and export policies, exchange rate policies, macroeconomic management policies (Grifi Z, Boutaib N, Ismail C, 2021, p. 94), regulatory policies, and trade policies toward trading partners.

Trade liberalization also fosters foreign investment, thereby promoting economic diversification. With increased foreign investment opportunities and streamlined trade procedures, foreign companies are establishing more plants and investment projects, creating new employment opportunities, and revitalizing non-oil sectors.

Foreign trade is a vital sector in any society, whether developed or developing, as it connects countries and communities, expands marketing capabilities, and contributes to the well-being of societies by broadening choices in consumption, investment, and the allocation of production resources in general (Boujmaa B, Malouk O, " 2016, p. 151).

Another benefit of trade liberalization is increased innovation and technology transfer. Through an increased open access to international markets, Algerian companies are discovering new technologies and learning best practices from their global counterparts. This contributes to improving operational efficiency and developing new products and services.

The importance of foreign trade has recently increased as a key factor in shaping the economic strategies of countries, particularly developing ones. In these countries, development policies are linked to foreign trade since exports generate



government revenue, while imports meet the demands of economic growth. Economic analysis links foreign trade to economic growth through the trade multiplier effect, meaning that the more a country's export capacity exceeds imports, the more positively it impacts economic growth. (Wa'il M, 2010, P.201)

Algeria's liberalization of foreign trade presents multiple challenges and opportunities. By addressing these challenges and capitalizing on available opportunities, Algeria can strengthen economic diversification beyond the oil & gas sector and achieve sustainable development.

2. Overview of economic diversification:

2.1 Diversification:

It is defined as the development of non-oil sectors and reducing reliance on oil, i.e., diversifying exports and thus government revenues. (Fasano U, 2003, p.1). Economic diversification also involves broadening the scope of economic activities, both in production and distribution of goods and services, to create opportunities for diverse economic activities on a large scale to provide employment opportunities and economic. (Bature, Bitrus N, 2013, pp. 06-14).

Economic diversification also refers to diversifying sources of national income, i.e., diversifying the production base and increasing non-oil production sectors in the gross domestic product to ensure the economy shifts its focus from the risks of relying on a single raw material or commodity. (Ismail H M, 2018, p. 148).

Based on the foregoing, economic diversification involves overcoming reliance on a single sector, particularly the oil & gas sector, by diversifying the sources of gross domestic product into different sectors such as industry, agriculture, and services, aiming to create employment opportunities and achieve economic stability.

The Arab Maghreb countries are striving to diversify their economies by developing new sectors such as agriculture, industry, and manufacturing. They are also committed to strengthening economic cooperation among the region's member countries to create a common market and customs union.

The countries of the Arab Maghreb have significant potential for economic diversification, given their human resources, unique geographical location, and diverse natural resources. By capitalizing on these assets, these countries can achieve sustainable economic growth.

Economic diversification in the Arab Maghreb countries has led to an increase in exports, imports, and gross domestic product (GDP). In Algeria, for example, exports of goods and services have risen from \$13 billion in 2000 to \$40 billion in 2022. Similarly, GDP has risen from \$80 billion in 2000 to \$250 billion in 2022.

Economic diversification promotes economic growth through several key mechanisms (Ben Attia S, Bouhafs H 2018, p. 325).

- **Reducing investment risks:** Diversification broadens investment opportunities across various economic activities, thereby reducing risks associated with concentrated investments in a few sectors. This strategy helps mitigate risks arising from natural disasters like earthquakes, droughts, floods, and fires, as well as international factors such as wars, monopolies,



and financial crises. By spreading investments across multiple products and sectors, diversification minimizes risks and enhances investment returns.

- **Mitigating risks of lower export revenues:** Countries heavily reliant on a limited range of exports face risks of reduced export revenues when global export prices decline. Economic diversification lessens this risk by reducing dependence on a small number of products, thus enabling countries to better finance imports and support economic development even during periods of fluctuating export prices.
- **Increasing human capital productivity:** Economic diversification is pivotal in enhancing labor and human capital productivity. By encouraging a diverse range of economic activities, it fosters innovation, skills development, and technological advancements. This, in turn, leads to higher productivity levels and contributes to overall economic growth rates.
- **((Strengthening inter-sectoral relations:** Diversification fosters a greater number of productive economic sectors, fostering stronger inter-sectoral relations and integration. This enhanced integration brings about positive external effects on production, leading to increased efficiency and output, thereby bolstering economic growth (Khateeb Mamdouh A, 1987, p. 08).
- **Achieving self-sufficiency:** Economic diversification boosts export earnings from goods and services while reducing reliance on imported consumer goods. This shift towards self-sufficiency not only strengthens the economy's resilience but also creates job opportunities, reduces unemployment rates, and elevates living standards within the population Ismail H M, 2018, p.149).

2.2. Determinants and indicators of economic diversification:

There are factors and measures used to assess the extent of diversification between economic sectors within a given country. These components enable an evaluation of economic diversification and provide insight into how economic activity is distributed across different sectors.

Our research findings indicate that economic diversification in the Arab Maghreb countries is determined by a set of factors that play a crucial role in shaping the economic structure and the degree of diversification across sectors. These factors include:

- **Government focus and economic policies:** The economic policies adopted by the government play a decisive role in achieving economic diversification. Support for diversification and encouragement of investment across multiple sectors lead to increased economic diversification.
- **Infrastructure and education:** The level of infrastructure development and the ability to provide essential services, including education and professional training, impact economic diversification. Advanced infrastructure and a skilled workforce foster growth in various sectors and strengthen diversification.
- **Foreign direct investment:** Direct foreign investment can contribute significantly to diversifying economic sectors in the Arab Maghreb countries.



Attracting investments across several sectors leads to higher levels of economic diversification.

- **Technology and innovation:** Technology and innovation play a crucial role in diversifying economic sectors. New technologies and innovations enable countries to develop new industries and enhance productivity in existing sectors.
- **Natural and geographical resources:** The availability of natural and geographical resources in the region can influence economic diversification. The Arab Maghreb countries possess a variety of resources that can promote diversification and the development of various sectors.
- **Foreign trade:** Foreign trade with other countries can impact economic diversification. Diversified exports and access to new markets contribute to greater economic diversification.
- **Culture and heritage:** The diversity of culture and heritage in the Arab Maghreb countries can influence economic diversification through the development of cultural and tourism industries, among others.

3. Economic diversity and foreign trade in the Maghreb countries and their connections to Algeria:

3.1 Economic diversity in Tunisia, Morocco, and Algeria is evident across various sectors:

- In Tunisia, economic diversification encompasses agriculture, industry, tourism, and services. Agriculture is significant, involving the cultivation of cereals, fruits, and vegetables. Industries such as textiles, automobiles, and electronics contribute to economic diversity. Moreover, the tourism sector is a significant income generator, attracting numerous tourists.
- Morocco's economic diversity is characterized by agriculture (specifically farming and the phosphate sector), industry (including textiles, apparel, and automobiles), and a thriving tourism industry, which is pivotal to the Moroccan economy.
- Algeria's economic diversification heavily relies on oil and natural gas, representing major revenue sources. Agriculture and industry also contribute to economic diversity in Algeria.

It's worth mentioning that economic diversity in these countries is influenced by a variety of internal and external factors, which can change over time due to economic, political, and social developments.

The three countries in the region—Tunisia, Algeria, and Morocco—recognize the need to adopt effective strategies to reduce their dependence on declining resources and transition towards diversifying various sources of income. These strategies include focusing on sensitive sectors and encouraging investment in agriculture, industry, and services, aiming for high levels of economic growth (Belqassem B, Barkat M, Miftah G, 2021, p. 515).

Consequently, the liberalization of foreign trade plays a crucial role in enhancing economic diversity in the Maghreb countries and Algeria. This role involves increasing competition, expanding into new sectors, and stimulating



exports. Foreign trade liberalization has already yielded positive economic benefits in Algeria, such as increased exports and gross domestic product. However, further efforts are required to strengthen economic diversity in Algeria and other Maghreb countries.

Given the critical economic situation of these three countries, particularly their dependence on specific resources without developing alternative sources to drive economic growth, effective strategies need to prioritize activating the private sector and involving it alongside the public sector. This entails fostering the creation of economic institutions and businesses in various sectors, considering them the primary drivers for achieving effective economic growth that significantly contributes to generating additional wealth—a vital criterion for measuring a country's economic strength worldwide (Belqassem B, BarkatM, Miftah G, 2021, p. 516).

It can also be noted that the liberalization of foreign trade is significantly impacting Algeria's GDP and the overall economy. By boosting export and import volumes, economic growth is bolstered, and new job opportunities are created for citizens.

Furthermore, liberalizing foreign trade is expanding business opportunities for Algerian companies in international markets. Producers and exporters can access new customers and broaden their customer base, resulting in increased exports and financial revenue for the country.

Moreover, the liberalization of foreign trade represents an opportunity for economic diversification in Algeria. When the country relies on multiple economic sectors instead of just one industry or sector, economic risks are reduced, and economic stability is reinforced.

Overall, the liberalization of foreign trade plays a pivotal role in enhancing economic growth and development in Algeria. It stimulates exports and imports, expands business opportunities, improves the quality of products and services for consumers, promotes technology and innovation, and supports economic diversification.

II. Implementation of the Study:

1. Research Methodology and Models:

Integration into the global economy strengthens economic growth, and countries that open their borders to foreign trade generally experience faster growth. However, despite the opportunities offered by globalization and trade, challenges and difficulties persist. Developing countries, including those in the Arab Maghreb region, may struggle to compete globally for various reasons. The study aims to examine the impact of trade liberalization on the economies of the Maghreb countries.

The study uses panel data for a sample of the Maghreb countries, specifically Morocco, Tunisia, and Algeria, covering the period from 1990 to 2022, spanning 33 years with an average of 99 observations ($33 * 3$). Panel data models were employed due to their enhanced predictive accuracy, accounting for temporal



changes and cross-country differences. The study also explored long-term equilibrium relationships using cointegration analysis.

Data were sourced from the World Bank's official website, and based on previous studies and economic theory, the model to be estimated representing the relationship between international trade and GDP is as follows:

$$GDP = f(LEXPORT, LIMPORT)$$

The logarithm was used to scale down variables with large numerical values. The variables in the study are defined as follows:

Table 1 : Variables of the study

Unit	Code	Name	Variable
Current value in U.S. dollars	LGDP	Local Gross Domestic Product	dependent
Current prices in U.S. dollars	LEXPORT	Annual exports	independent
Current prices in U.S. dollars	LIMPORT	Annual imports	

Source: prepared by the authors

1.1 Descriptive Statistical Analysis of Study Variables:

The table below presents descriptive statistics of the study variables generated using EViews software.

Table 2 : Descriptive statistics

	GDP	EXPORT	IMPORT	LGDP	LEXPORT	LIMPORT
Mean	7.58E+10	2.51E+10	2.35E+10	24.80091	23.69375	23.62820
Median	4.82E+10	1.96E+10	1.91E+10	24.59816	23.69739	23.67290
Maximum	2.14E+11	8.20E+10	7.15E+10	26.08835	25.13041	24.99312
Minimum	1.23E+10	5.28E+09	5.19E+09	23.23210	22.38676	22.36981
Std. Dev.	5.41E+10	1.85E+10	1.63E+10	0.725453	0.716352	0.723917
Skewness	0.971912	1.246300	0.776757	-0.006091	0.143944	0.100405
Kurtosis	2.798112	3.879720	2.442745	2.205118	2.023590	1.627683
Jarque-Bera	15.75423	28.82123	11.23626	2.606939	4.274555	7.934765
Probability	0.000379	0.000001	0.003631	0.271588	0.117976	0.18923

Source: prepared by the authors by based on Eviews software

In the table above, we present the descriptive statistics for the variables included in the study, along with their aggregate and adjusted values in the standard analysis after applying the logarithm. It is noted that the average gross domestic product is US\$75,834,695,997, with the highest value of US\$213,809,980,720.787 recorded in Algeria for 2014, while the lowest value is US\$12,290,568,182 in Tunisia for 1990.

Regarding the independent variables, the average value of exports is US\$25,090,342,055, with the highest value of US\$82,034,752,287 recorded in Algeria in 2008, and the lowest value of US\$5,277,717,391 in Tunisia in 1991. The average value of imports is US\$23,471,242,424, with a maximum value of



US\$7,151,100,000 recorded in Morocco in 2022, and a minimum value of US\$518,900,000 in Tunisia in 1991.

The Skewness coefficient is positive and non-zero, indicating a more concentrated distribution on the right (positive values). The Kurtosis coefficient is close to value of 3, a distinctive value for a normal distribution of all variables, suggesting that these series do not contain outliers, except for the export variable, which slightly exceeded the value (3.87). However, when log-transformed, the variables do not exceed a Kurtosis coefficient of 3.

The Jarque Bera test results show variable values with a probability exceeding the significance level of 0.05 for all variables, rejecting the hypothesis of a normal distribution at a significance level of 5%. However, after log transformation, the probability exceeds 0.05, indicating the presence of a normal distribution.

A graphical representation of the variables is provided in the appendix.

1.2 Examining the correlation between the study variables:

The Pearson correlation coefficient in statistics is used to measure the strength of the relationship between two variables and their correlation with each other. The Pearson correlation coefficient calculates the impact of variation in one variable when the other variable changes; its value is bounded by the interval $[-1,1]$.

Table 3: Correlation coefficient

	LGDP	LEXPORT	LIMPORT
LGDP	1	0.9279	0.88077
LEXPORT	0.9279	1	0.91477
LIMPORT	0.88077	0.91477	1

Source: prepared by the authors by based on Eviews software

The table above presents the correlation coefficients between the different variables, indicating the type of relationship based on the sign (positive or negative) and the strength of the correlation (a coefficient close to 1 indicates a strong correlation, whether positive or negative). However, it does not specify whether the effect is statistically significant or not.

The table shows a significantly positive correlation coefficient for gross domestic product (GDP) with exports (0.92) and imports (0.88), indicating a strong positive relationship between each of the foreign trade indicators and GDP in the Arab Maghreb countries.

Causality Test: A causal relationship is considered to exist in the short term if the probability is less than 0.05, leading to the acceptance of the alternative hypothesis. Conversely, if the probability is greater than 0.05, the null hypothesis of no causal relationship between the variables is accepted.

**Table 4 : Granger causality test**

Pairwise Dumitrescu Hurlin Panel Causality Tests			
Null Hypothesis:	W-Stat.	Zbar-.	Prob.
LEXPORT does not homogeneously cause LGDP	3.28504	2.38223	0.0172
LGDP does not homogeneously cause LEXPORT	0.63590	-0.47211	0.6368
LIMPORT does not homogeneously cause LGDP	0.53965	-0.57583	0.5647
LGDP does not homogeneously cause LIMPORT	4.53573	3.72981	0.0002
LIMPORT does not homogeneously cause LEXPORT	0.61111	-0.49883	0.6179
LEXPORT does not homogeneously cause LIMPORT	7.24568	6.64967	3.E-11

Source: prepared by the authors by based on Eviews software

From the table above, we can deduce the following:

- Exports impact gross domestic product (GDP) due to the presence of a causal relationship between them, demonstrated with a probability of less than 0.05. An increase in exports leads to an influx of foreign currency and enhances international demand for goods and services, consequently boosting domestic production.
- Gross domestic product (GDP) influences imports, but not the other way around. This is because an increase in GDP enhances people's standard of living by increasing their income share, enabling them to afford imported goods, which are typically more expensive in the Arab Maghreb countries.
- There is no causal relationship between exports and imports.

1.3 Stability and Cointegration Panel Data Integration Analysis:

To estimate panel data models, we initially assess the stability of the time series and cross-sectional data for the various model variables in this study. Subsequently, we investigate long-term relationships and conduct simultaneous integration tests for variables with the same order of differentiation. For this purpose, we employ several tests developed for analyzing and examining unit roots in panel data.

However, if these series are non-stationary, using them in the estimation process can yield misleading and sometimes erroneous results. The null hypothesis posits the existence of a unit root, signifying non-stationarity in the time series. Conversely, the alternative hypothesis posits the absence of a unit root, indicating stationarity in the time series. If the p-value falls below the significance level of 0.05, we reject the null hypothesis, signifying that the time series is stationary.



Table 5: Unit root test for variables

		At level			First diff		
	test	intercept	Intercept & trend	None	intercept	Intercept & trend	None
LGDP	Levin, Lin & Chu t*	-1.72 (0.05)	0.92 (0.82)	4.80 (1.00)	-7.72 (0.00)	-7.54 (0.00)	-7.25 (0.00)
	ADF - Fisher Chi-square	4.63 (0.59)	1.45 (0.96)	0.08 (1.00)	51.07 (0.00)	42.77 (0.00)	55.52 (0.00)
	PP - Fisher Chi-square	4.39 (0.62)	1.87 (0.93)	0.11 (1.00)	51.02 (0.00)	42.81 (0.00)	56.12 (0.00)
LEXP	Levin, Lin & Chu t*	-0.11 (0.45)	0.66 (0.74)	3.95 (1.00)	7.89- (0.00)	-6.53 (0.00)	-7.63 (0.00)
	ADF - Fisher Chi-square	1.98 (0.92)	2.27 (0.89)	0.23 (0.99)	51.0 (0.00)	39.21 (0.00)	59.10 (0.00)
	PP - Fisher Chi-square	1.93 (0.92)	2.52 (0.86)	0.2 (0.99)	50.92 (0.00)	40.09 (0.00)	59.30 (0.00)
LIMP	Levin, Lin & Chu t*	-0.07 (0.47)	0.53 (0.70)	3.99 (1.00)	-7.5 (0.00)	-6.69 (0.00)	-7.46 (0.00)
	ADF - Fisher Chi-square	1.25 (0.97)	8.59 (0.19)	0.05 (1.00)	52.59 (0.00)	42.88 (0.00)	57.84 (0.00)
	PP - Fisher Chi-square	1.31 (0.97)	2.01 (0.91)	0.11 (1.00)	52.85 (0.00)	42.29 (0.00)	59.60 (0.00)

Source: prepared by the authors by based on Eviews software

The initial values in the table denote the statistics, while the values in parentheses indicate the probability value for each statistic (%). According to the results of the stability tests for the variables displayed in the table above, the probability at the specified level exceeds 0.05, indicating the presence of a unit root. However, at the level of the first difference, the probability is less than 0.05, signifying the stability of the series of variables. Consequently, first differences will be included in the linear regression equation.

Cointegration: As all the variables studied are stationary to the first difference (I(1)), we can explore the potential for long-term equilibrium relationships among these variables using the Johansen-Fisher test.

**Table 6: Cointegration Test**

Johansen Fisher Panel Cointegration Test				
Hypothesize	Fisher Stat.*	Fisher Stat.*	Fisher Stat.*	Fisher Stat.*
d	(from trace test)	Prob.	(from max-eigen test)	Prob.
No. of CE(s)				
None	21.26	0.0016	17.66	0.0071
At most 1	8.971	0.1752	7.484	0.2784
At most 2	10.45	0.1069	10.45	0.1069

Source: prepared by the authors by based on Eviews software

The results of the Johansen-Fisher test for cointegration suggest that the hypothesis of at least two long-term equilibrium relationships among the variables in the study is accepted. Both tests have a significance level (sig) greater than 0.05, indicating the presence of cointegration among the study variables. This confirms the existence of a long-term equilibrium relationship regarding the impact of the independent variables on the dependent variable.

The cointegrating relationship among the study variables can be estimated using an error correction model (ECM), which incorporates short-term changes into the long-term relationship. This is linked to the ARDL (Autoregressive Distributed Lag) approach to determine the extent of cointegration.

Table 7: Testing for a long-term lagged relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LEXPORT	0.434314	0.125881	3.450196	0.0009
LIMPORT	0.438466	0.114021	3.845476	0.0002
Short Run Equation				
COINTEQ01	-0.307690	0.151567	-2.030056	0.0459
D(LGDP(-1))	0.049312	0.198884	0.247946	0.8048
D(LEXPORT)	0.145822	0.021794	6.691068	0.0000
D(LEXPORT(-1))	3.74E-06	0.092620	4.04E-05	1.0000
D(LIMPORT)	0.071090	0.131968	0.538689	0.5917
D(LIMPORT(-1))	-0.112558	0.198941	-0.565785	0.5732
C	1.268369	0.598997	2.117487	0.0375

Source: prepared by the authors by based on Eviews software



The results of the estimation presented in the table above indicate that the error correction coefficient is statistically significant, with a corresponding probability below the 0.05 significance level. Furthermore, its negative sign confirms the existence of a long-term equilibrium relationship among the variables in the study. The absolute value of the coefficient (0.3) represents the speed of adjustment from the short term to the long term.

By selecting a lag order of 1, the variables exhibit no statistically significant effect in the short term, as the probability corresponding to Student's t statistic exceeds 0.05. Therefore, we conclude that the impact of international trade on gross domestic product occurs in the long term.

1.4 Estimation of panel time series models

The panel time series models were estimated using EViews software, employing the ordinary least squares (OLS) method. This method is considered one of the best estimation techniques for time series data. First differences were applied to variables that are stationary. The results of the regression models are presented below.

Table 8: Results of the regression equation test

	Pools		Fixed effect		Random effect	
	Coeffi	Prob	Coeff	Prob	Coeff	Prob
D(EXPOR)	0.306049	0.0000	0.306170	0.0000	0.306049	0.0000
D(IMPORT)	0.246781	0.0001	0.248000	0.0001	0.246781	0.0001
C	0.011862	0.0926	0.011788	0.0981	0.011862	0.0958
R-squared	0.607707		0.608581		0.607707	
Adjust R-squa	0.599270		0.591376		0.599270	
F-statistic	72.03376		35.37185		72.03376	
Prob(F-statistic)	0.000000		0.000000		0.000000	
Durbin-Wats stat	1.849088		.1854153		1.849088	

Source: prepared by the authors by based on Eviews software

The table above indicates that all three models were statistically significant based on Fisher's F-test. The calculated F-value (Fca) exceeded the tabulated F-value (Ftab), and the probability was below the 5% significance level (probability of 0.0000). The model exhibited a good explanatory power, with an R-squared value exceeding 60%.

The Durbin-Watson statistic (1.84) is close to 2, which is the optimal value indicating no autocorrelation problem with the residuals.

In the coefficient section, which assesses the effect of independent variables on the dependent variable, the probability (Prob) is less than 0.05 for the explanatory variables in all three models. Additionally, the coefficients are consistently positive across all three models, confirming the positive impact of exports and imports on gross domestic product.



Model selection test: While the results exhibit similarity and consistency across the three models, a statistical comparison is necessary. The comparison is presented in the following table.

Table 9: Model Selection Test

Redundant Fixed Effects Tests			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.101625	(2,91)	0.9035
Cross-section Chi-square	0.214179	2	0.8984
Correlated Random Effects - Hausman Test			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.203250	2	0.9034

Source: prepared by the authors by based on Eviews software

If we evaluate each test individually, the first test suggests a preference for the aggregate model over the other models if the probability is greater than 0.05. However, to compare fixed and random models, the Hausman test is utilized. Given that the probability of the restricted Fisher test exceeds 0.05, we can accept the null hypothesis that the aggregate model is superior and reject the alternative hypothesis favoring the fixed-effect model. This conclusion holds true regardless of the result of the Hausman test.

Model's validation: Before adopting the model, it is crucial to verify that there are no autocorrelation issues among the random errors and that their variances exhibit homoscedasticity.

Table 10: Homoscedasticity Test for Residuals

Panel Cross-section Heteroskedasticity LR Test			
	Value	Df	Probability
Likelihood ratio	4.372480	3	0.2240
Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	12.90766	3	0.4848
Pesaran scaled LM	4.044787		0.0001
Pesaran CD	1.206435		0.2276

Source: prepared by the authors by based on Eviews software

By analyzing the test results presented in the table above and noting the probability values exceeding 0.05, we can affirm that the model is free from autocorrelation issues among the residuals. Additionally, the probability values from the Breusch-Pagan and Pesaran tests surpass 5%, indicating the absence of



heteroscedasticity problems. Consequently, we can place reliance on the results derived from the selected model.

The Study Equation: After confirming that the suitable model is the aggregate model and ensuring its appropriateness, we formulate the regression equation for the model as follows:

$$Y = D(GDP) = 1.26263914997 * D(EXPORT) + 0.331992388038 * D(IMPORT) + 891710709.23$$

The coefficients of the lagged independent variables in the regression equation should exhibit statistical significance, meaning they are statistically different from zero. To verify this, a Wald test was conducted.

Table 11: Wald test

Wald Test:			
Test Statistic	Value	df	Probability
F-statistic	72.03376	(2, 93)	0.0000
Chi-square	144.0675	2	0.0000

Source: prepared by the authors by based on Eviews software

Since both the F and Wald test statistics exceed their respective critical values, and the probability value is less than 0.05, we reject the null hypothesis and accept the alternative hypothesis. This indicates that the coefficients of the explanatory variables are statistically different from zero. Therefore, we can conclude that the model is acceptable for the study.

Study Results Analysis: The study aims to determine the impact of foreign trade on economic diversification by assessing the effect of exports and imports on the gross domestic product (GDP) of the Arab Maghreb countries from 1990 to 2022. Due to the extensive timeframe, we examined the relationship in both the short- and long-term using panel data. Our conclusions are as follows:

- There exists a strong positive correlation between international trade and GDP.
- According to the Granger causality test, exports can predict GDP, while imports cannot.
- The Johansen cointegration methodology utilized in this study confirmed a long-run equilibrium relationship for exports and imports with the GDP variable in the cointegrating regression equation. This relationship demonstrated a speed of adjustment to equilibrium of around 30%.
- In the short term, the study revealed the absence of a causal relationship for the cointegrating equations of the variables studied.



- The coefficient of exports on GDP is statistically significant at 0.3, indicating that an increase in exports of one unit leads to a 0.3 unit increase in GDP.
- Similarly, the coefficient of imports on GDP is statistically significant at 0.24, signifying that an increase in imports of one-unit results in a 0.24 unit increase in GDP.

All tests clearly demonstrated that exports and imports contribute to GDP growth. However, this impact was not immediately apparent in the short term but became more pronounced over time, indicating that the trade liberalization policies adopted by the Maghreb countries are yielding positive results due to their economic openness to the global market. Their products are now reaching international markets, while foreign products are entering their local markets, increasing competition. This has positively affected national production volumes, leading to favorable outcomes in the labor market by reducing unemployment rates, lowering prices, and promoting economic diversification.

Countries that embrace global trade typically experience accelerated growth, innovation, enhanced productivity, and improved access and opportunities for their citizens. Trade openness also benefits low-income countries, such as those in the Arab Maghreb, by providing affordable goods and services to consumers. Integration into the global economy through trade and global value chains helps bolster economic growth and alleviate poverty locally and globally.

Conclusion:

Algeria, like other oil-producing nations, has accumulated significant financial resources from the oil & gas sector in recent years. These revenues have played a pivotal role in improving sustainable development indicators, such as infrastructure development and rising individual incomes. This stands in contrast to countries reliant on other revenue sources for economic development, often lacking a clear strategic path. Hence, there is a critical need for these countries to explore viable alternatives to diversify their economies.

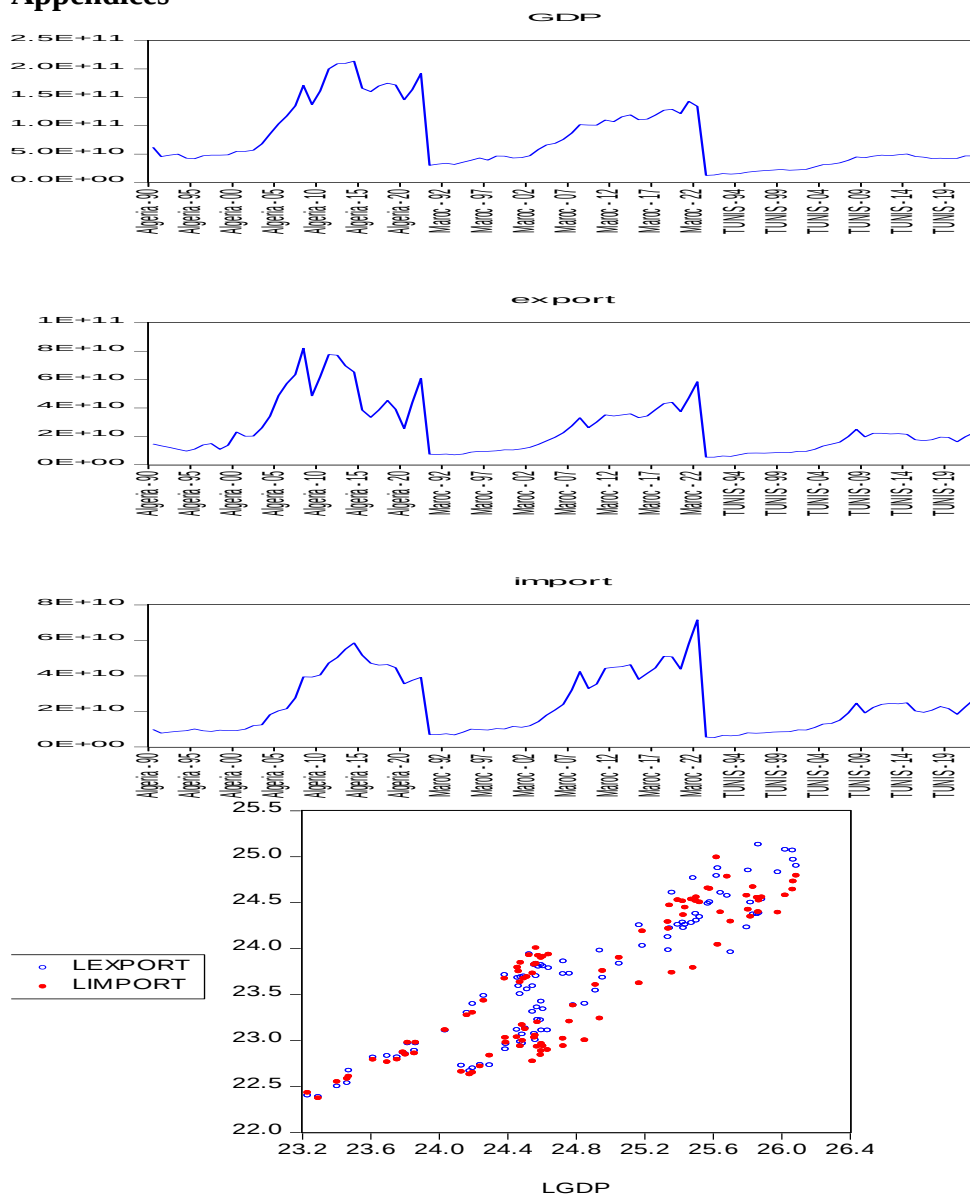
The discussion underscores that upgrading and revitalizing sectors beyond the oil & gas industry are crucial alternatives that promote economic development and foster diversification through various exports. By investing in and nurturing sectors outside the dominant oil and gas sector, countries like Algeria can enhance economic resilience, reduce dependence on a single industry, and pave the way for long-term sustainable growth and prosperity.

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Appendices



Individual cross section results

Cross Section	Trace Test Statistics	Prob.**	Max-Eign Test Statistics	Prob.**
Hypothesis of no cointegration				
Algeria	37.5642	0.0052	24.6711	0.0152
Maroc	28.9074	0.0630	19.1892	0.0915
TUNIS	28.3161	0.0733	18.7203	0.1052
Hypothesis of at most 1 cointegration relationship				
Algeria	12.8931	0.1188	11.3861	0.1359
Maroc	9.7182	0.3030	9.5547	0.2428



TUNIS	9.5958	0.3131	5.1839	0.7185
Hypothesis of at most 2 cointegration relationship				
Algeria	1.5070	0.2196	1.5070	0.2196
Maroc	0.1635	0.6859	0.1635	0.6859
TUNIS	4.4119	0.0357	4.4119	0.0357

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

Dependent Variable: D(LGDP)

Method: ARDL

Date: 10/01/23 Time: 20:41

Sample: 1992 2022

Included observations: 93

Maximum dependent lags: 4 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (4 lags, automatic): LEXPORT LIMPORT

Fixed regressors: C

Number of models evaluated: 16

Selected Model: ARDL(2, 2, 2)

Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
LEXPORT	0.434314	0.125881	3.450196	0.0009
LIMPORT	0.438466	0.114021	3.845476	0.0002
Short Run Equation				
COINTEQ01	-0.307690	0.151567	-2.030056	0.0459
D(LGDP(-1))	0.049312	0.198884	0.247946	0.8048
D(LEXPORT)	0.145822	0.021794	6.691068	0.0000
D(LEXPORT(-1))	3.74E-06	0.092620	4.04E-05	1.0000
D(LIMPORT)	0.071090	0.131968	0.538689	0.5917
D(LIMPORT(-1))	-0.112558	0.198941	-0.565785	0.5732
C	1.268369	0.598997	2.117487	0.0375
Mean dependent var	0.044425	S.D. dependent var	0.094009	
S.E. of regression	0.051887	Akaike info criterion	-2.724399	
Sum squared resid	0.204616	Schwarz criterion	-2.121492	
Log likelihood	157.8577	Hannan-Quinn criter.	-2.480462	

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

Dependent Variable: D(LGDP)

Method: Panel Least Squares

Date: 10/01/23 Time: 20:22

Sample (adjusted): 1991 2022

Periods included: 32

Cross-sections included: 3

Total panel (balanced) observations: 96



Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEXPORT)	0.306049	0.044048	6.948037	0.0000
D(LIMPORT)	0.246781	0.060310	4.091847	0.0001
C	0.011862	0.006980	1.699283	0.0926
R-squared	0.607707	Mean dependent var		0.041201
Adjusted R-squared	0.599270	S.D. dependent var		0.099225
S.E. of regression	0.062813	Akaike info criterion		-2.666568
Sum squared resid	0.366925	Schwarz criterion		-2.586432
Log likelihood	130.9953	Hannan-Quinn criter.		-2.634175
F-statistic	72.03376	Durbin-Watson stat		1.849088
Prob(F-statistic)	0.000000			

Dependent Variable: D(LGDP)

Method: Panel Least Squares

Date: 10/01/23 Time: 20:23

Sample (adjusted): 1991 2022

Periods included: 32

Cross-sections included: 3

Total panel (balanced) observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEXPORT)	0.306170	0.044484	6.882747	0.0000
D(LIMPORT)	0.248000	0.061122	4.057461	0.0001
C	0.011788	0.007054	1.671104	0.0981

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.608581	Mean dependent var	0.041201
Adjusted R-squared	0.591376	S.D. dependent var	0.099225
S.E. of regression	0.063428	Akaike info criterion	-2.627132
Sum squared resid	0.366108	Schwarz criterion	-2.493572
Log likelihood	131.1023	Hannan-Quinn criter.	-2.573145
F-statistic	35.37185	Durbin-Watson stat	1.854153
Prob(F-statistic)	0.000000		