The Impact of Economic Openness on Export Diversification: A Case Study of Algeria for the Period 1995–2025

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Abstract:

The purpose of this study is analyze the relationship of economic openness with the modifications of Algeria's export structure. Therefore, using econometric methods of time-series data, the effect of trade openness, investment freedom, business freedom, tax burden, and government integrity on the diversification of export structure will be reviewed. The time span of this analysis is from 1995 to 2025 and uses the Autoregressive Distributed Lag (ARDL) model. The analysis showed that investment freedom negatively impacts export diversification in Algeria in the long run. In the short run, government integrity and trade openness negatively influence export structure diversification, while investment freedom, business freedom, and tax burden positively influence the diversification of Algeria's export structure.

Keywords: Economic openness, governance, export diversification, ARDL model.

Jel Classification Codes: **:** F43, O1, O14, C22.

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1. INTRODUCTION

The last few decades have marked economic openness as one of the most notable changes witnessed in developing economies. This has coincided with the implementation of economic policies regarding the liberalization of foreign trade, the repealing of both tariff and non-tariff trade barriers, and the promotion of foreign direct investments. This policy prescription aims to enhance the developing economy's integration into the global economy and the allocation of resources in a manner that achieves sustainable economic growth.

Within this context, a key measure of the success of economic openness policies is the diversification of exports. In theory, economic openness should extend the production line, capture and disseminate new technologies, improve the quality of the existing production line, and eliminate the trade barriers created by domestic competition. Open economies are also able to create new foreign markets from which domestic production can derive profits. Additionally, countries with open economies are able to reduce their dependency on one product or sector and therefore are able to limit their economic vulnerability to external shocks.

Considering that Algeria has a long history of a dominant export economy characterized by a strong concentration of exports in the hydrocarbon sector, it is of utmost importance to assess the extent of economic diversification following economic liberalization. The extent to which liberalization policies and structural adjustments can activate alternative value-added export sectors is a primary component for assessing the effectiveness of the economic policies used.

- **Research Problem**: This study attempts to answer the following question: To what extent has economic openness contributed to the diversification of Algeria's export structure during the period 1995–2025?
- **Research Questions**: From the main research question, a number of sub-questions arise:

- To what extent does the trade openness variable affect the diversification of the export structure in Algeria?
- To what extent does the investment freedom variable affect the diversification of the export structure in Algeria?
- To what extent does the business freedom variable affect the diversification of the export structure in Algeria?
- To what extent does the tax burden variable affect the diversification of the export structure in Algeria?
- To what extent does the government integrity variable affect the diversification of the export structure in Algeria?

- **Research Hypotheses**: To provide an initial response to the research question, the study proposes the following hypotheses:
  - Trade openness has a positive and significant relation to the export structure diversification in Algeria.
  - Investment freedom has a positive and significant relation to the export structure diversification in Algeria.
  - Business freedom has a positive and significant relation to the export structure diversification in Algeria.
  - Tax burden has a negative and significant relation to the export structure diversification in Algeria.
  - There is no relation of government integrity to the export structure diversification in Algeria.
- **Objectives of the Study**: This study aims to measure and analyze the impact of economic openness, represented by trade openness, investment freedom, business freedom, tax burden, and government integrity, on the diversification of Algeria's export structure during the period 1995–2025.
- **Methodology and Tools Used**:The study employs both methods descriptively measuring what the phenomenon is, and analytically measuring what the relationships are among the study variables. This is done through econometrics and time-series analysis, which is aligned to the overall objectives of the study and the integration of the theory to practice.

1. Theoretical Literature of the Study

Many studies have tackled the subject of economic freedom, examining different facets of it, and performing analyses of the macro and micro levels. However, only a few have dealt specifically with economic openness in terms of the different scales of trade, business, investment, labor, and financial and monetary freedom and what the consequences are on the competitiveness of products, the productivity and competitiveness of markets (both domestic and international), the economic growth and the export growth of the economy outside the oil and gas sector.

This part of the study presents some of the related studies that consider different facets of the subject.

- **Study by Chafik and Yassine (2025):** Using official sources from multiple databases, this paper evaluates export diversification from 1995 to 2022 and examines what factors influence the economies of Algeria through quantile regression. Results show that domestic investment and export of manufactured products foster the industrial orientation of export development and diversification. Algeria's oil revenue and trade openness, as well as foreign direct investments, negatively affect the country's export diversification. Researchers maintain that their findings

enrich the discourse on foreign trade and provide policymakers with a foundation to craft more balanced trade enhancement strategies focused on Algeria's trade potential (Chafik & Yassine, 2025).

- **Study by Zubin Khaja Ahmadi et al. (2025):** The Impact of Trade Openness on Economic Growth in South Asian Countries" is a study that examines the influence of trade openness on economic growth, and productivity and export diversification, as well as in the eight South Asian countries from 1980 to 2023.The analysis identifies trade and economic growth's short- and long-term equilibrium and possible relationships using some econometric techniques. With trade openness, short-term impact is statistically weak and insignificant, while long-term impact is weak but statistically growth positive. Overall, openness to trade statistically positively impacts economic growth. The study indicates that situational positive changes must occur so that trade can bring more positive economic growth results. This study indicates that open trade policies enhance explains productivity, diversification and growth via specialization, technology transfer, and market extension. The researchers further conclude that economic growth positively impacts South Asian economies; remaining confident based on trade openness, leans towards impracticality. Any reliance on trade liberalization will not bring positive situational changes towards the positive economic growth envisioned (Zubin Khaja Ahmadi et al., 2025).
- **Study by Ali Altiner et al. (2024):** This paper aims to uncover the factors that influence export diversification between 2000 and 2022 in 85 developing countries. The study considers a number of independent variables that are believed to have a discernible impact on the diversification of export products, some of which are the economic growth, foreign direct investment, productive capacity index, elements of the labor force, inflation, government expenditure, and openness of trade. The findings indicate that an increase in productive capacity, capital, labor, and government expenditure positively contributes to the diversification of export products. In contrast, economic growth and trade openness negatively impact export diversification within African countries. In addition to this, increased productive capacity and foreign direct investment positively contribute to the diversification of exports, whereas government expenditure negatively contributes to this. For countries in America, an increase in the labor force and trade openness positively contributes to the diversification of exports. For countries in Asia, the findings show that an increase in productive capacity, capital, labor, and government expenditure positively contributes to the diversification of export products. (Ali Altiner et al, 2024)
- **Research conducted by Hussein Faraj Al-Huwaij (2023):** This paper uses econometric analysis to examine the impact of trade openness on the diversification of exports in Libya between 1962 and 2017. The study noted that as trade openness increases, so does export diversification, as there is a negative relationship between trade openness and the export concentration index. FMOLS results show a trade openness having a negative causation relationship on the export concentration index, meaning that the effect, though negative, is positive on export diversification. The researcher highlights that the relationships, in this case, do not reflect true causation. She states that trade openness in Libya is currently not positively causing export diversification and calls for production and trade policy adjustments along with structural diversification of the economy so that trade openness can positively cause export diversification (Al-Huwaij, 2023).
- **Study by Tayeb Abdel-Laoui et al. (2020):** This study seeks to understand the influence of economic openness and governance on the level of export diversification and the extent of

economic growth in a sample of Arab countries for the period 1995–2018. The study analyzes the impact of economic openness and governance on the diversification of the export structure and economic growth. The study found that the freedom of investment plays an important role in the diversification of exports because it broadens specialization and the division of labor and creates an investment environment that integrates domestic companies into the global supply and production chains.The study also showed that governance positively influences the growth of the economy. This means that countries with high levels of integrity, as well as governments that practice good governance, tend to have more prosperous economies. This suggests that the economic policies that a government implements in order to stimulate economic growth and development are more successful (Tayeb Abdellaoui et al., 2020).

- **Study by Patrick N. Osakwe et al. (2019):** The study, titled "Trade Dependence, Liberalization and Export Diversification in Developing Countries", analyses the correlation of trade, trade liberalization and export diversification in developing countries by means of some statistical techniques. The findings suggested that developing countries that are more open in trade tend to have a more diversified export structure compared to countries with less trade openness. However, in the case of the countries in South Sub-Saharan Africa, the findings revealed that the more open a country is, the more it tends to have a less diversified export structure. It was also found that liberalized trade through the reduction of tariffs will lead to an improved diversification of exports in developing countries, and in the countries of South Sub-Saharan Africa, the effect would be felt more in the long run. On the other hand, in Sub-Saharan Africa, increased trade intensity is linked to short-term diversification, but in the long run, it can result in export concentration. The authors also state that export diversification is significantly affected by the amount of human capital, the GDP per capita, and the quality of institutions (Patrick N. Osakwe et al., 2019).
- Previous studies reveal a disparity in the findings regarding the relationship between economic liberalization and export diversification. Most studies have focused on trade liberalization or specific economic determinants in isolation, with limited research addressing the combined economic and institutional dimensions of economic liberalization, particularly in the Algerian context.

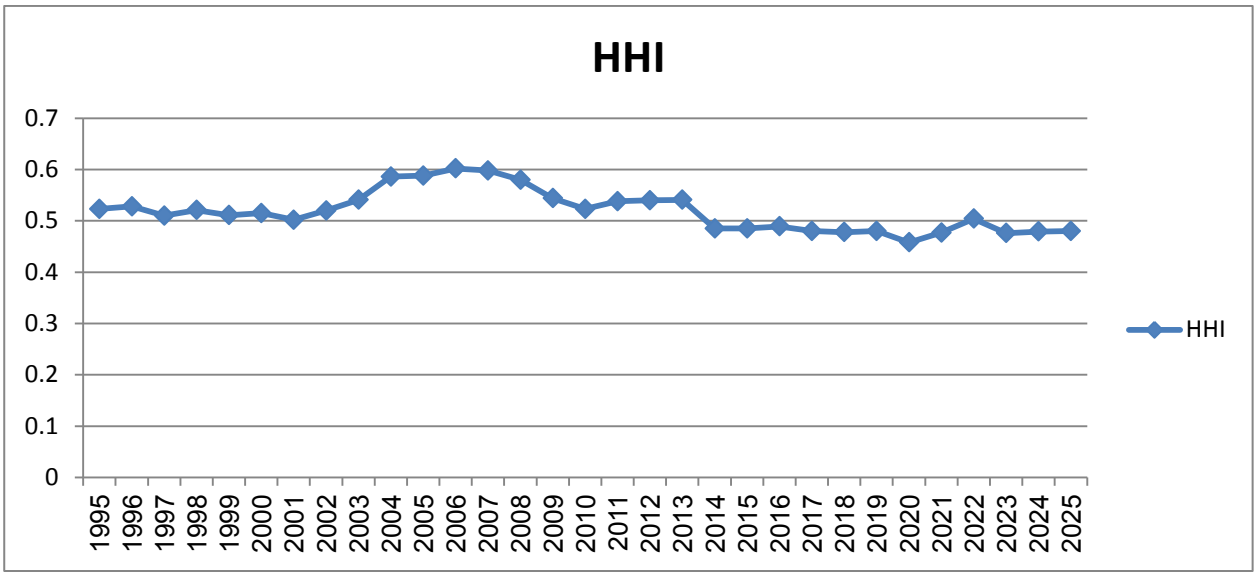
  This study aims to bridge this gap by analyzing the impact of various dimensions of economic liberalization—namely, trade liberalization, investment freedom, business freedom, tax burden, and government integrity—on the diversification of Algeria's export structure during the period 1995–2025.

  The study's scholarly contribution lies in presenting a comprehensive model that integrates the economic and institutional dimensions of economic liberalization to measure its impact on export diversification. This model enriches the economic literature and provides up-to-date findings to support policymakers in promoting Algerian export diversification.

2. Analysis of the Reality of Export Diversification in Algeria During the Period : 1995–2025

The export concentration index indicates the degree to which a country depends on a limited number of export commodities. In the case of Algeria, the index showed clear fluctuations during the period 1995–2025, as illustrated in Figure (1). These fluctuations are attributed to a set of economic and structural factors, mainly related to the rentier nature of the Algerian economy, which heavily relies on hydrocarbons.

Figure 01. Development of the Export Concentration Index in Algeria during the period 1995–2025.



Source: Prepared by the researcher based on UNCTAD data.

From the figure above, it is evident that the export concentration index recorded a continuous increase between 1995 and 2007. This rise was mainly due to the dominance of hydrocarbons in Algerian exports and the limited contribution of other sectors, which meant that export diversification was very limited during this period.

However, during the period 2008–2025, the export concentration index fluctuated between increases and decreases. The most important factor explaining these fluctuations is the volatility of oil and gas prices in global markets. This factor is considered the most influential determinant of export concentration in Algeria, since the country relies heavily on hydrocarbons (oil and gas), which often account for more than 85% of total exports.

Despite government efforts, the structure of the Algerian economy remained weakly diversified during this period, mainly due to the limited diversification of the productive base, the weak performance of industrial exports, and the limited competitiveness of domestic products.

Nevertheless, the decline in the export concentration index during certain years and the relative diversification of export structures were partly due to growth in non-oil exports in some periods. In certain years, the index declined relatively as exports outside the hydrocarbon sector increased, such as:

- Agricultural products (dates and vegetables)
- Iron and steel
- Fertilizers and chemical products
- Cement and semi-processed materials

These developments contributed to the expansion and diversification of the export basket. However, these increases were often unstable or limited in size compared to oil exports.

Furthermore, during the period 2008–2025, the global economy experienced several shocks that affected international trade, including:

- The global financial crisis (2009)
- The oil price crisis (2014–2016)
- The COVID-19 pandemic (2020)
- Disruptions in global supply chains

These shocks affected global demand for energy and commodity prices, which in turn influenced the volume and diversification of Algerian exports, leading to frequent changes in the export concentration index.

In addition, government policies adopted by Algeria in recent years have contributed to export diversification. Among these policies are:

- Customs and logistical facilitation measures
- Support for exporting enterprises
- Establishment of institutions to promote exports
- Encouragement of manufacturing industries and agriculture

These policies have contributed to a relative increase in non-oil exports and some diversification, especially after 2020, resulting in a slight decline in the export concentration index in certain years. However, their impact remains gradual and has not yet fundamentally transformed the export structure.

4. RESULTS AND DISCUSSION

In this part of the study, we attempt to estimate and measure the impact of economic openness on the diversification of Algeria's export structure during the period 1995–2025, using the software EViews 12.

- **Study Variables and Data Sources**

The objective of this study is to determine the effect of economic openness on the diversification of the export structure in Algeria. In order to answer the research questions, the export concentration index is used as the dependent variable.

The independent variables consist of the sub-components of economic openness, represented by:

Trade Freedom (TRD_FREE), Business Freedom (BUS_FREE), Investment Freedom (INVST_FREE),Tax Burden (TAX_BRD), In addition, the variable Government Integrity (GOV_INTEGT) is included as an indicator reflecting aspects of governance.

The data sources used in the study are as follows:

- Heritage Foundation database for data related to economic openness indicators and government integrity.
- United Nations Conference on Trade and Development (UNCTAD) statistics database for the export concentration index.

- **Model Estimation, Analysis, and Interpretation of Results**

The model used in this study is estimated according to the following functional form:

HHI = F (INVST_FREE, TRD_FREE, TAX_BRD, GOV_INTEGT, BUS_FREE)

Where:

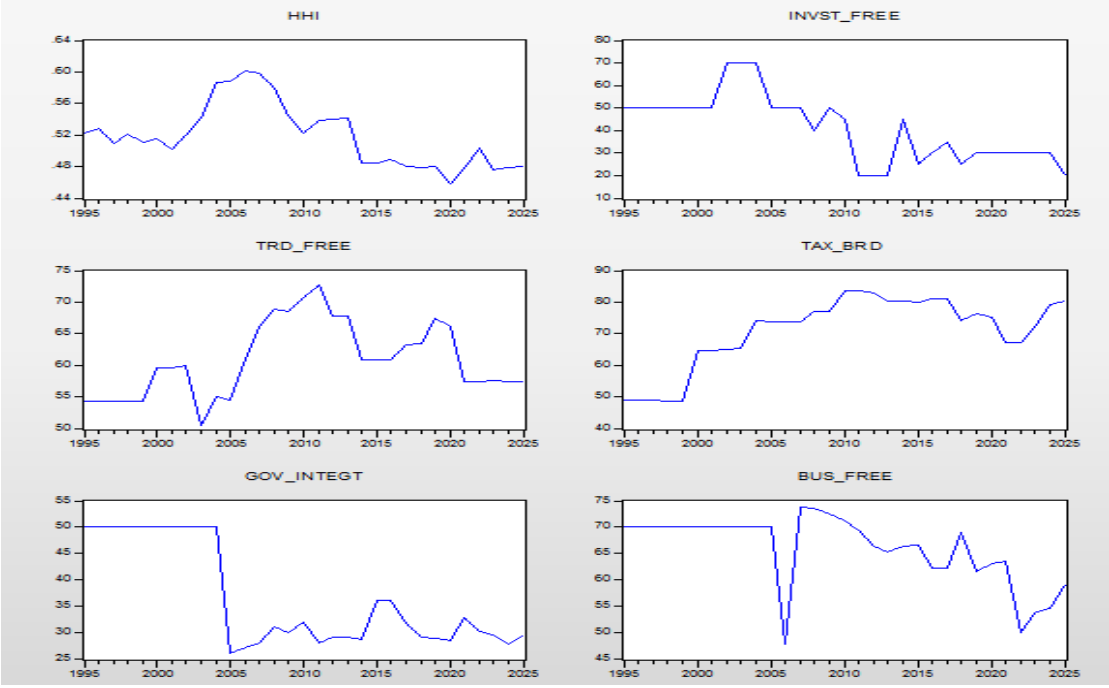
- HHI: Export Concentration Index
- INVST_FREE: Investment Freedom
- TRD_FREE: Trade Freedom
- TAX_BRD: Tax Burden
- GOV_INTEGT: Government Integrity
- BUS_FREE: Business Freedom

A. Graphical Representation of the Time Series of Study Variables

From Figure (02), which presents the time series of the study variables in their logarithmic form, it can be observed that the six series contain a general trend.

To verify the presence of both a constant and a trend in the time series of the research variables, regression analyses were conducted by regressing each of the six variables on a constant and a general time trend. The results showed that both the constant and the trend are statistically significant in all six models.

Figure 02.Graphical representation of time series.



Source: Prepared by the researcher using OxMetrics 7 software.

B. Unit Root Test for Time Series Stationarity

To test the stationarity of the time series, the Augmented Dickey-Fuller (ADF) test was used. This test aims to determine the order of integration of the time series, which is an essential step in identifying the appropriate econometric model to measure the relationship between the study variables, and also to avoid the possibility of obtaining spurious regression results.

The results of the stationarity test are presented in Table (1).

Table (1). Results of the Stationarity Test for the Study Variables Using the Augmented Dickey-Fuller (ADF) Test

UNIT ROOT TEST TABLE (ADF)						
At Level	**HHI**	**INVST_FREE**	**TRD_FREE**	**TAX_BRD**	**GOV-INTEGT**	**BUS_FREE**
t-Statistic	-1.795	-1.5483	-2.0336	-1.9075	-1.5311	-3.2982
Prob	0.6700	0.4959	0.2717	0.3246	0.5045	0.0240 **
t-Statistic	-1.7179	-3.0198	-1.8174	-1.5317	-2.1630	-4.7777
Prob	0.7182	0.1437	0.6710	0.7955	0.4918	0.0032 ***
t-Statistic	-0.4700	-1.0999	0.0249	1.0649	-1.5613	-0.8618
Prob	0.5034	0.2398	0.6829	0.9211	0.1097	0.3343
At First Difference	**HHI) d(**	**INVST_FREE) d(**	**d (TRD_FREE)**	**d(TAX_BRD)**	**d(GOV-INTEGT)**	**d(BUS_FREE)**
t-Statistic	-4.8100	-8.0537	-5.3027	-5.2059	-5.9481	-19.7901
Prob	0.0006 ***	0.0000 ***	0.0002 ***	0.0002 ***	0.0000 ***	0.0001 ***
t-Statistic	-4.7341	-8.2837	-5.8356	-6.0975	-6.6346	-26.2689

Prob	0.0037 ***	0.0000 ***	0.0003 ***	0.0001 ***	0.OOO0 ***	0.0000 ***
t-Statistic	-4.8672	-7.1044	-5.3995	-5.0024	-5.6995	-12.5470
Prob	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***	0.0000 ***

Source: Prepared by the researcher based on EViews 12 software output.

From Table (1), which presents the results of the unit root test for the stationarity of the time series of the study variables, the null hypothesis stating that the series contain a unit root is accepted, while the alternative hypothesis stating that the series are stationary at level is rejected.
It can be observed that all the series are non-stationary at level, since the ADF test statistic values are lower than the critical values at all statistically significant levels. However, when taking the first difference of the series, the ADF test results show that all series become stationary at the 1% significance level.
According to the results of the stationarity tests, it can therefore be concluded that all the time series of the study variables are integrated of order one, I(1). Based on this result, the Autoregressive Distributed Lag (ARDL) model is considered the most appropriate method for estimating the relationship between the variables, as suggested by Pesaran, Shin, and Smith (2001).

C. Model Diagnostic Tests

The model must undergo a series of diagnostic tests to determine its efficiency and validity, ensuring that it is free from econometric problems and suitable for analysis. These tests include the following:

- **These tests examine the properties of the residuals (Residual Diagnostics Tests):** and include:
  - Serial Correlation LM Test *(Breusch, 1978)*
  - Normality Test *(Jarque & Bera, 1980)*
  - Heteroskedasticity Test (ARCH) *(Engle, 1982)*

Table (2). Results of Residuals Diagnostics Tests

Tests			Stat-Value	Prob
Breusch-Godfrey serial corrélation LM test Null hypothesis: no serial correlation at up to 2 lags		F-Statistic	0.806179	0.4713
		Obs*R-Square	3.707345	0.1567
Normality test (Jarque bera) Null hypothesis: Residual are normally Distributed			0.744469	0.689193
Heteroskedasticity Test Null hypothesis: Heteroskedasticity	**ARCH**	F-Statistic	0.220685	0.6424
		Obs*R-Square	0.235660	0.6274

Source: Prepared by the researcher based on the outputs of EViews 12 software.

From Table (2), which presents the results of the Residual Diagnostics Tests, the following observations can be made:

- Serial Correlation LM Test:
  The results indicate that the model does not suffer from the problem of serial correlation. The probability value of the Breusch–Godfrey statistic is 0.4713, which is not statistically significant at the 5% level. Therefore, the null hypothesis stating that the residuals are free from serial correlation is accepted.

- Normality Test:
  The results show that the residual series follows a normal distribution. The probability value of the Jarque–Bera statistic is 0.689193, which is not statistically significant at the 5% significance level. This leads to the acceptance of the null hypothesis that the residuals are normally distributed.
- Heteroskedasticity Test:
  The results indicate that the model does not suffer from heteroskedasticity. The probability value of the ARCH statistic is 0.6424, which is not statistically significant at the 5% level, leading to the acceptance of the null hypothesis that the residual variance is homoskedastic (constant).

- **Ramsey RESET Test:** This test examines the functional specification of the model *(Ramsey, 1969)*.

Table (3). Results of the Ramsey RESET Test

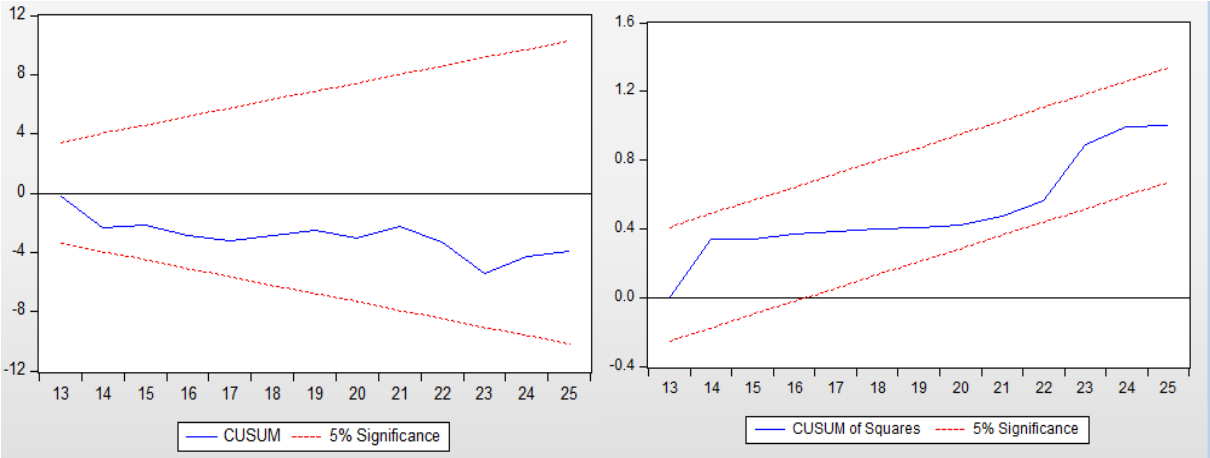
	Value	Prob
t−statistic	0.876815	0.3978
F−statistic	0.768804	0.3978

Source: Prepared by the researcher based on EViews 12 software outputs.

The results of the Ramsey RESET Test indicate that the model does not suffer from misspecification. This conclusion is based on the probability values of both the t-statistic and F-statistic, which are 0.3978, exceeding the 5% significance level. Therefore, the null hypothesis stating that the model is correctly specified is accepted, indicating that the model is properly and adequately specified.

- **Structural Stability Tests of the Model :**To ensure the structural stability of the model and verify the absence of structural changes during the study period, the following tests are conducted:
  - CUSUM Test (Cumulative Sum of Recursive Residuals)
  - CUSUM of Squares Test These tests were developed by Brown, Durbin, and Evans (1975).

Figure (3). Results of the CUSUM and CUSUM of Squares Tests



Source: Outputs from EViews 12 software.

From Figure (3), it is evident that the graph of the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) lies within the critical bounds at the 5% significance level. This confirms the absence of structural changes in the data and indicates that the model is structurally stable.

It also shows that the model parameters remain stable across repeated samples, and it confirms the stability of the relationship among the study variables, as well as the consistency between the short-run and long-run results.

* After the model successfully passed all the tests, including:
  - Residual diagnostics tests,
  - Ramsey RESET Test,
  - Structural stability tests,

it can be concluded that the model is appropriate for interpreting the studied phenomenon and estimating the relationship between the variables in both the short run and the long run. This is because the model is free from econometric problems, statistically significant, and econometrically robust.

D.Cointegration Test Using the Bounds Test Approach:

The cointegration relationship between the dependent variable and the independent variables is tested according to the Autoregressive Distributed Lag (ARDL) model using the Bounds Test approach. The results of the test are presented in the following table.

Table (4). Results of the Cointegration Test Using the Bounds Test Approach

Test Statistic	Value	
t-statistic	5.604985	
Signif	I(0)	I(1)
10%	2.407	3.517
5%	2.91	4.193
1%	4.134	5.761

Null Hypothesis: No levels relationship

Source: Prepared by the researcher based on EViews 12 outputs.

From Table (4), it can be observed that the calculated F-statistic equals 5.604985, which exceeds the upper bound of the critical value at the 1% significance level. This leads to rejecting the null hypothesis stating that no long-run equilibrium relationship exists between the study variables, and accepting the alternative hypothesis, which indicates the existence of a long-run equilibrium relationship.

Accordingly, the study variables are cointegrated, meaning that there is a long-run equilibrium relationship running from the independent variables toward the dependent variable.

E.Estimation of the Long-Run Relationship of the Model:

The long-run relationship is estimated in order to obtain the long-run coefficients of the model, after confirming the existence of cointegration between the independent variables and the dependent variable.

The results are presented as follows:

Table (5). Results of the Estimation of the Long-Run Relationship Between the Model Variables

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INVST_FREE	0.008663	0.004166	2.079475	0.0579
TRD_FREE	0.015800	0.012532	1.260782	0.2295
TAX_BRD	0.002753	0.003698	0.744319	0.4699
GOV_INTEGT	0.011389	0.011364	1.002242	0.3345
BUS_FREE	-0.018772	0.015537	-1.208253	0.2485
C	-0.171736	0.487598	-0.352209	0.7303

EC = HHI - (0.0087*INVST_FREE + 0.0158*TRD_FREE + 0.0028*TAX_BRD + 0.0114*GOV_INTEGT -0.0188*BUS_FREE -0.1717)

Source: EViews 12 software outputs.

The table shows that the majority of the independent variable have no significant contrast to the said dependent variable, export concentration (HHI). The only exception to that table is Investment Freedom (INVST_FREE), which is positively correlated and significant at the 10% level.

This indicates that investment freedom increases export concentration and leads to lower levels of export diversification, which is contrary to the predictions of economic theory. The theory would suggest that investment the freedom would positively lead to higher levels of export diversification because it promotes specialization and the division of labor, leading to the optimal allocation of resources aligned with absolute and comparative advantages, and the competitive +/– availability of resources. This would provide countries with the means to compete in the international marketplace, and would be beneficial to the economy.

Algeria's economy is largely rentier; thus, when investment is liberalized, it directs funds to sectors that require little risk and provide quick returns. These are sectors that already have large comparative advantages, such as oil and hydrocarbons. This is in line with the Heckscher–Ohlin model, which suggests that countries that have an abundance of one factor, like oil (which is considered natural capital), will focus on the production of goods that require that factor, and in large quantities.

As a result, export concentration in primary or semi-primary commodities increases instead of expanding and diversifying the export base. Moreover, in resource-dependent economies, investment flows into the resource sector often lead to an increase in the real exchange rate and a decline in the competitiveness of export-oriented manufacturing industries, as labor and capital shift toward the booming resource sector. This phenomenon contributes to a relative contraction in export diversification.

Additionally, according to the economic complexity literature (Hausmann & Hidalgo, 2007), export diversification requires latent productive capabilities, such as skills, technology, and institutional capacity. If these capabilities are limited, and in the absence of technical education policies, research and development support, and innovation-oriented financing, investment flows tend to favor low-complexity activities that generate quick returns. Thus, liberalization alone does not create new sectors; rather, it tends to reinforce existing ones.

Regarding the other economic openness variables—Trade Freedom (TRD_FREE), Business Freedom (BUS_FREE), Tax Burden (TAX_BRD), and Government Integrity (GOV_INTEGT)—the results show that none of them are statistically significant in their relationship with export concentration (HHI) in the long run. This indicates that their effects have not translated into greater diversification of Algerian exports.

In other words, the trade and financial liberalization policies adopted by Algeria since the 1990s have not led to a fundamental transformation of the export structure, which has remained highly dependent on hydrocarbons. This situation can be explained by several interrelated structural and institutional factors.

Foremost among these factors is the dominance of the hydrocarbon sector in the national economy, along with the large inflows of foreign currency associated with it, which contribute to appreciating the real exchange rate. This weakens the competitiveness of manufacturing industries and other export-oriented sectors outside the energy sector, a phenomenon known as Dutch Disease.

Furthermore, the limited backward and forward linkages between the energy sector and other productive sectors have constrained the transfer of technology and knowledge, thereby weakening the prospects for building a diversified industrial base.

Export diversification also requires latent productive capacities, including advanced technical skills, efficient supplier networks, and institutions that support innovation and investment. However, the weakness of these structural elements, combined with fragile business environments and limited integration into global value chains, has reduced the impact of trade openness and business freedom on restructuring exports.

In addition, economic policy volatility and regulatory uncertainty, reflected in frequent changes in investment rules, ownership restrictions, and complex administrative procedures, have increased uncertainty for investors. As a result, investors tend to prefer low-risk sectors closely linked to oil rents.

These challenges are further compounded by gaps in human capital and weaknesses in research, development, and innovation systems, which are essential for enabling the economy to move toward more complex and diversified products.

Therefore, it can be concluded that economic openness, despite its importance, has not been sufficient on its own to generate a structural transformation in Algeria's export pattern, due to the absence of the institutional and productive conditions necessary to support diversification. This explains the continued high concentration of exports in the long run.

F. Short-Run Relationship Estimation(Error Correction Model – ECM-ARDL):

Table (6). Results of the ECM-ARDL Error Correction Model (Short Run)

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INVST_FREE)	-0.000511	0.000228	-2.238903	0.0433
D(INVST_FREE(-1))	-0.001498	0.000276	-5.419326	0.0001
D(TRD_FREE)	0.001400	0.000638	2.194713	0.0470
D(TRD_FREE(-1))	-0.003133	0.000716	-4.375425	0.0008
D(TAX_BRD)	-0.001092	0.000500	-2.182685	0.0480
D(TAX_BRD(-1))	-0.001277	0.000554	-2.305547	0.0383
D(GOV_INTEGT)	0.000833	0.000446	1.868652	0.0844
D(BUS_FREE)	-0.001015	0.000415	-2.444233	0.0295
D(BUS_FREE(-1))	0.000979	0.000329	2.972698	0.0108
CointEq(-1)*	-0.202293	0.026714	-7.572536	0.0000

R-squared	0.838648	Mean dependent var	-0.001655
Adjusted R-squared	0.762218	S.D. dependent var	0.020316
S.E. of regression	0.009907	Akaike info criterion	-6.124433
Sum squared resid	0.001865	Schwarz criterion	-5.652952
Log likelihood	98.80428	Hannan-Quinn criter.	-5.976771
Durbin-Watson stat	2.422268		

Source: EViews 12 software outputs.

Based on earlier analysis, the error correction coefficient sits at −0.202293, which has a negative coefficient and is statistically significant at the 1% mark. This shows there is a functioning short run equilibrium adjustment mechanism, which strengthens the previously established cointegration relationship.

This coefficient means that each year approximately 20.23% of short-run disequilibria is corrected. This indicates that the system is on the right track to a long-run equilibrium.

Other results show that there are short-run statistically significant relationships between the dependent variable Export Concentration (HHI) and the independent variables Investment Freedom

(INVST_FREE), Trade Freedom (TRD_FREE), Business Freedom (BUS_FREE), Tax Burden (TAX_BRD), and Government Integrity (GOV_INTEGT) in Algeria.

Investment Freedom Results show that there exists a short-run statistically significant negative relationship between Investment Freedom (INVST_FREE) and export concentration (HHI) at the 5% significance level. Furthermore, the lagged value of investment freedom has a negative statistically significant impact on export concentration (HHI) at the 1% level.

This implies that when investment freedom increases, short run export diversification occurs. Investment freedom promotes a positive investment climate through:

- Public administration improvement
- Regulatory predictability
- Streamlined trade
- Financing policies that support SMEs and startups

These aspects support enhanced participation in global value chains.

Furthermore, freedom of investment encourages specialization and division of labor, resulting in an efficient distribution of the means of production based on comparative advantage, thereby enhancing the international competitiveness of a country's goods.

Trade Freedom

Trade Freedom (TRD_FREE) exhibits a short run positively correlated relationship with export concentration (HHI) at a 5% significance interval which implies that increased trade freedom concentration leads to a decrease in diversification of exports which goes against the expectations of trade theory.

Importantly, trade freedom's lagged value exhibits a short run negative correlation with export diversification at a 1% significance interval which indicates that greater trade openness of the preceding year leads to lower export concentration and greater export diversification in the short run.

Trade freedom positively impacts export diversification through the removal of quantitative and price-related export restrictions. Furthermore, trade freedom enhances fair competition as opposed to protective negative competition which reallocates resources inefficiently. Lastly, trade freedom further enhances export diversification through the positive provision of less expensive intermediate goods to countries which decreases the production cost of the good.

Tax Burden

The short run, 5% significance interval provides an increasing negative relationship between the tax burden (TAX_BRD) and export concentration (HHI).The lagged value of the tax burden also negatively impacts export concentration.

Consequently, increased tax burden leads to increased export diversification.

Economic theory posits that increased taxation has a negative effect on industry competitiveness and leads to a lack of export diversification. However, in rentier economies such as Algeria, it is possible that a higher tax burden on the dominant oil sector could restrict excessive expansion of that sector and, in turn, assist in rebalancing the economy and perhaps increase export diversification.

Government Integrity

Short-run estimations show a positive effect of the variable Government Integrity (GOV_INTEGT) on export concentration at the 10% level. This means that a change in Government Integrity can lead to a temporary decrease in a country's export diversification.

There are temporary decreases in diversification due to the exit of inefficient firms as a result of imposed regulations as a result of improvements in governance, such as regulatory enforcement, stronger rule of law, and the effective functioning of institutions.

Business Freedom

Statistical results show a 5% significance level of a short-run negative relationship of Business Freedom (BUS_FREE) to export concentration (HHI). This means that more business freedom, in that same year, equates to less export concentration.

However, the lagged value of business freedom has a positive effect on export concentration at the 1% significance level. This means that having more business freedom a year before leads to more export concentration in the following year.

This means that business freedom can, at the beginning, be a catalyst of diversification by:

- Making it easier to create businesses
- Making property rights more effective
- Making private investments more easily
- Lowering costs of transactions

These factors lead to the entry of new firms and subsequently greater export diversification.

Nonetheless, in the long term, increased liberalization of business may result in the concentration of resources in the most profitable sector, which in Algeria is the energy sector, further intensifying the concentration of exports rather than diversifying them.

5. CONCLUSION

This paper attempts to quantify how economic openness affects export diversification in Algeria. In answer to the research question, the effects of the variables trade openness, investment freedom, business freedom, tax burden, and government integrity, were evaluated. The dependent variable, export concentration index, was measured during the period of 1995–2025.

For the study, the Autoregressive Distributed Lag (ARDL) model was used. This model is one of the advanced econometric techniques and is appropriate for the analysis of time series data that is not integrated at the same order.

The findings demonstrated that, in the absence of investment freedom, the independent variables showed no statistically significant relationship with the dependent variable in the long-term, this negates all the hypotheses except the second one.

Regarding the export concentration index, the positive and statistically significant relationship of investment freedom suggests that the increase in investment freedom strengthens export concentration and reduces export diversification, This is consistent with the second hypothesis. Considering the Algerian economy to be rentier, it is reasonable to assume that the liberalization of investment would facilitate the flow of capital to those sectors that possess a significant comparative advantage, particularly in oil. This is in line with what the Heckscher–Ohlin model states that resources will be attracted to sectors that use the abundant locally available resources the most.

The results show that, in the short-run, the independent variables affect export concentration, and this effect is statistically significant.

More specifically, the elements of investment freedom, business freedom, and tax burden negatively influence export concentration, and thus the strengthening of these policies may contribute to increasing export diversification in the short run.

On the other hand, the variables trade openness and government integrity positively influence export concentration, meaning that the economic openness policies of these two dimensions may increase export concentration as opposed to export diversification.

- **Recommendations:** A number of recommendations may be outlined from the findings of the analysis:

- Target investment freedom policies to sectoral diversification
- Short-term policies that encourage export diversification should be strengthened
- Trade openness policies should be reframed to focus on the export diversification
- Improve government integrity with a focus on economic diversification
- Long-term integrated industrial policy
- Ensure harmonization of the economic liberalization policies with the structural diversification limits, through the right policy mix to guide openness towards sustainable and balanced economic development.
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