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The Impact of Air Transport on Algerian Non-Oil Imports (1979–2024)

أثر النقل الجوي على الواردات غير النفطية في الجزائر (1979–2024)

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Abstract: This study examines the impact of air transport on Algeria's non-oil imports from 1979 to 2024. It adopts an inductive approach using descriptive and analytical methods, alongside a quantitative analysis based on the ARDL model. Results show a positive relationship between air passenger traffic and non-oil imports, as increased passenger numbers drive demand for imported goods, reflecting higher income levels and greater economic openness. Conversely, while air freight supports the movement of high-value, time-sensitive goods, its overall contribution to total imports remains limited compared to maritime transport.

Keywords: Air Transport; Imports ; Non-Oil ; ARDL Model ; Algeria

ملخص: تهدف هذه الدراسة إلى تحليل أثر النقل الجوي على الواردات غير النفطية في الجزائر خلال الفترة 1979–2024. وقد اعتمدت على منهج استقرائي يجمع بين الأسلوبين الوصفي والتحليلي، إلى جانب تحليل كمي باستخدام نموذج ARDL. وتُظهر النتائج وجود علاقة إيجابية بين حركة المسافرين جوا والواردات غير النفطية، حيث يؤدي ارتفاع عدد المسافرين إلى زيادة الطلب على السلع المستوردة، مما يعكس تحسن مستويات الدخل واتساع الانفتاح الاقتصادي. في المقابل، يساهم الشحن الجوي في نقل السلع عالية القيمة وسريعة التلف، لكن تأثيره على إجمالي الواردات يظل محدودا مقارنة بالنقل البحري.

الكلمات المفتاحية : النقل الجوي ؛ الواردات ؛ غير النفطية؛ نموذج ARDL؛ الجزائر

I- Introduction :

Air transport represents one of the fundamental pillars of economic infrastructure, as its role extends beyond mere transportation to serving as a catalyst for economic growth and international trade by facilitating the movement of people and goods and connecting local markets with global markets. In Algeria, air transport serves as a key tool for promoting economic openness, contributing to the support of non-oil trade by enabling passenger mobility for purposes such as business, tourism, and education, thereby increasing demand for imported goods. Air cargo, on the other hand, plays a more specialized role, focusing on the transportation of time-sensitive and high-value goods, such as medical equipment, electronics, and industrial spare parts. Despite its importance, its impact remains limited compared to maritime transport, which carries the bulk of imports, especially heavy goods and raw materials. Nevertheless, the development of air cargo

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infrastructure enhances the speed and efficiency of supply chains and provides opportunities to expand trade in high-value products.

Moreover, the effectiveness of air transport is closely linked to the country's financial capacity, specifically the availability of foreign currency generated from hydrocarbon exports, making the relationship between air transport and non-oil imports also dependent on the external economic health of the country.

I –1 Research Problem: Based on the above discussion, the main research problem of the study can be formulated in the following key question:

What is the impact of air transport on non-oil imports (1979–2024)?

I –2 Hypotheses: In order to answer the research problem and provide further clarification, the study hypotheses are formulated as follows:

- Air transport has a negative impact on non-oil imports in Algeria;
- Besides air transport, there are other factors that have positively affected imports in Algeria.

I –3 Objectives of the Study: This study aims to analyze and measure the relationship between air transport and non-oil imports in Algeria (1979–2024). It also seeks to highlight how passenger traffic and air freight influence consumer and commercial demand, with a focus on the role of air transport as a strategic tool for enhancing economic openness.

I –4 Study Methodology: To address the research problem and examine the components of this study, the inductive approach was adopted by using descriptive and analytical methods in the theoretical framework. In the empirical part, a quantitative approach was employed through the use of the (ARDL) model.

II – Analysis of the Reality of Air Transport and Imports in Algeria (1979–2024)

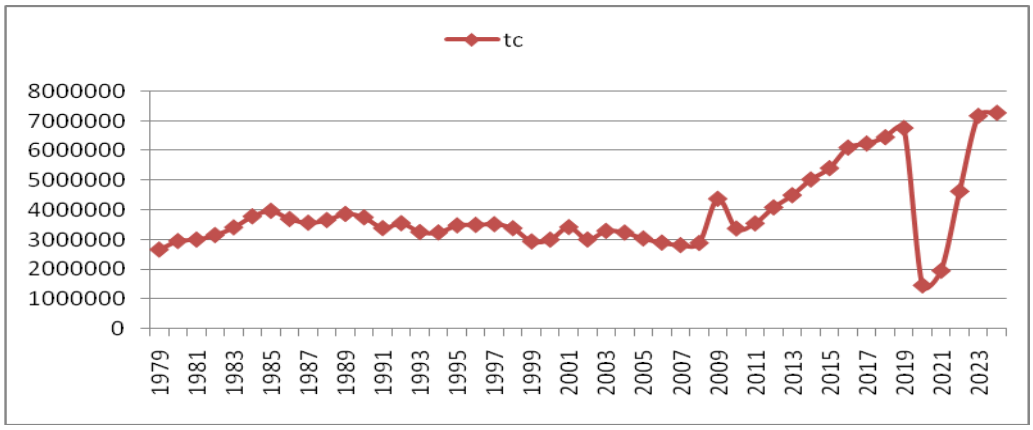
The Air transport is the best means for traveling long distances, as it is characterized by its high cost and its ability to deliver goods within the specified time (Kachkouch, 2018, p. 238) . And foreign trade are considered fundamental pillars for enhancing integration into the global economy, as the latter facilitates the movement of people and goods and connects national markets with international markets. In this context, Algeria occupies a special position due to its strategic geographical location and economic potential. However, the performance of these two sectors has undergone significant transformations during the period from 1979 to 2024.

II –1 Analysis of the Development of Air Transport in Algeria (1979–2024)

The study of air transport development in Algeria from 1979 to 2024 is crucial for examining both passenger and cargo aviation, assessing their efficiency, and understanding their role in bolstering the national economy. While air transport costs are expected to grow more slowly than overall consumer prices, the sector faces significant pressures from large-scale investment demands and newly imposed fees. Persistent uncertainty over long-term fuel prices further complicates the landscape (ICAO Circular, 1978 - 2000 , p. 3). Additionally, economic shifts impacting the industry

raise concerns for airport operations, air traffic infrastructure, and the modernization of aircraft fleets, highlighting key obstacles to growth and potential avenues for future advancement.

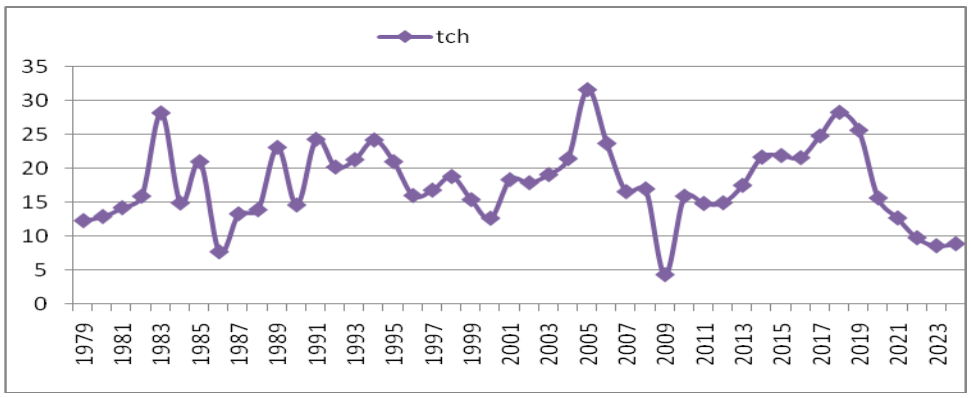
Figure (01): Air Transport Passengers Carried



The Source: (World Bank Data, 2026)

Passenger air transport data in Algeria (1979–2024) indicate a long trajectory of gradual growth, interspersed with sharp fluctuations linked to economic, security, and health conditions. The sector experienced significant expansion in the early 1980s, with the number of passengers rising from approximately 2.66 million to nearly 4 million, driven by relative improvements in infrastructure and increased travel demand. However, this momentum declined from the late 1980s and throughout the 1990s, as figures showed notable decreases and fluctuations due to the economic crisis and deteriorating security situation, which negatively affected air transport activity. With the beginning of the new millennium, a gradual recovery started, though it remained limited until the end of the first decade. The sector then recorded a significant leap in 2009, followed by a period of strong and sustained growth between 2010 and 2019, during which the number of passengers nearly doubled, thanks to improved stability, airport development, and rising demand, particularly from the Algerian diaspora. However, the COVID-19 (Othmane & Amel, 2020, p. 487) pandemic caused an unprecedented collapse in 2020, with a sharp decline in passenger numbers, before the sector quickly regained its strength starting in 2022, reaching record levels in 2023 and 2024, exceeding 7 million passengers. Overall, this trajectory reflects that air transport in Algeria is highly sensitive to crises but possesses strong recovery capacity, with promising growth prospects under improving general conditions. The figure below illustrates the development of air cargo transport in Algeria as follows:

Figure (02): Air Transport – Cargo (Million Ton-Km)



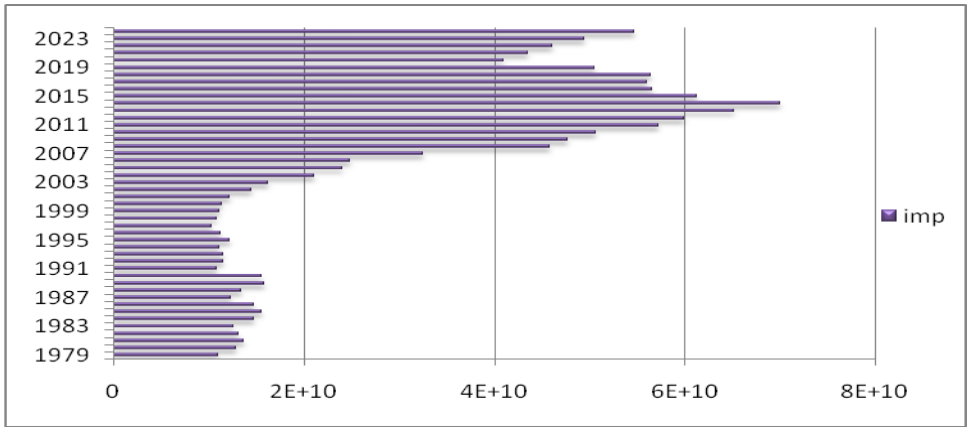
The Source: (World Bank Data, 2026)

Air cargo data in Algeria (1979–2024) show a fluctuating trajectory, reflecting the sensitivity of this activity to economic and logistical changes rather than long-term stable growth. In the first phase (late 1970s and early 1980s), a notable increase in cargo volume was recorded, peaking in 1983, due to the expansion of trade and heightened economic activity. However, this trend did not continue, as the subsequent period saw significant fluctuations, with a sharp decline in 1986 linked to the economic crisis and falling oil revenues. During the 1990s, instability persisted at moderate levels, influenced by the security situation, before the sector experienced a relative improvement in the early 2000s, peaking in 2005, reflecting economic recovery and increased demand for air freight. This improvement, however, was short-lived, as activity declined again with a sharp drop in 2009, likely related to the global financial crisis and weak international demand. Since 2010, air cargo experienced a phase of gradual and fluctuating recovery until 2019, with indicators improving relatively but not reaching stable or very high levels. With the emergence of the COVID-19 pandemic in 2020, the sector entered a new wave of decline that continued until 2024, with values falling to their lowest levels compared to previous decades. Overall, it is clear that air cargo in Algeria is a relatively unstable sector, heavily affected by global economic crises and its limited integration into international trade chains. This makes it less dynamic compared to passenger transport, despite possessing significant growth potential if logistical infrastructure is developed and trade openness is enhanced. Thus, air transport generates both direct and indirect economic returns, which are reflected in its impact on other economic activities linked to this sector (Habiban bin Mansour, 2024, p. 4) .

II –2 Analysis of the Development of Non-Oil Imports and the External Balance in Algeria (1979–2024)

Non-oil imports refer to goods purchased from abroad that are consumed as substitutes for domestic products (belkhir & abdelkader, 2024, p. 213) . Imports and the external balance are among the most important economic indicators reflecting the extent of a country's integration into the global economy and the nature of its productive structure. Imports serve as a tool to meet domestic needs for goods and services, while the external balance reflects the state of equilibrium between financial inflows and outflows in the national economy. Studying the development of these two indicators is of particular importance in Algeria during the period 1979–2024, as illustrated in the figures below.

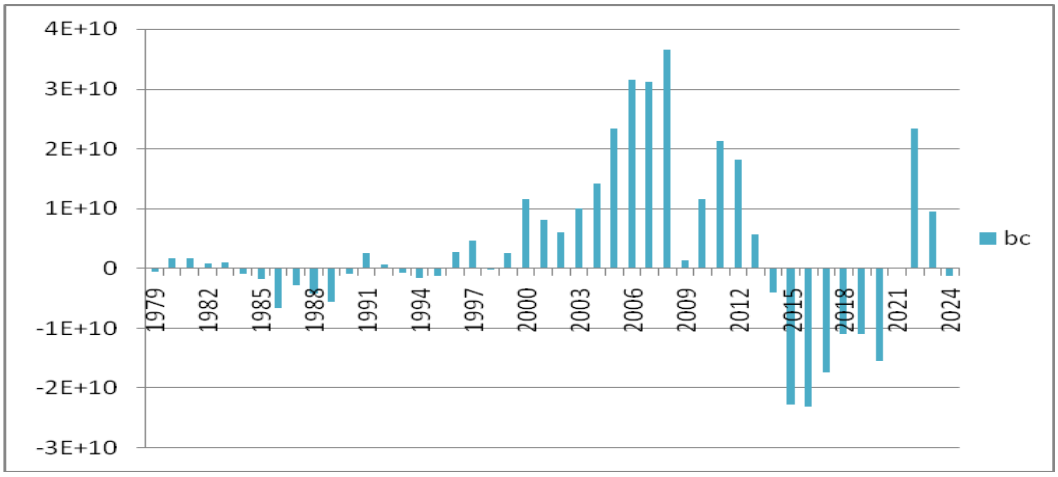
Figure (03): Non-Oil Imports in Algeria (Current US Dollars)



The Source: (World Bank Data, 2026)

Non-oil import data in Algeria (1979–2024) show a long-term upward trajectory, reflecting the increasing reliance of the national economy on foreign sources to meet its needs for goods and services, despite periods of decline linked to economic crises. In the first phase (1979 late 1980s), imports remained at moderate levels with relative fluctuations, influenced by oil price volatility, which is the main source of foreign currency. The collapse of oil prices in the mid-1980s reduced the country's import capacity. During the 1990s, imports experienced a clear decline and stabilized at relatively low levels due to the economic crisis, structural adjustment programs, and the security situation, which affected economic activity. With the beginning of the new millennium, Algeria entered a phase of strong import expansion, particularly between 2004 and 2014, when imports jumped from around 21 billion USD to over 70 billion USD, driven by rising oil prices and increased revenues, enabling massive financing of consumer and capital goods imports. However, this trend reversed after 2014, as imports declined significantly due to falling oil prices and the adoption of import rationalization policies. Nevertheless, despite the decrease recorded between 2015 and 2020, imports gradually increased again starting in 2021, reaching approximately 54.6 billion USD in 2024, reflecting the ongoing structural need for imports. Overall, these data reveal an economic structure heavily dependent on foreign sources, with a close link between import levels and oil revenues, highlighting the challenge of economic diversification and reducing import dependency. The figure below illustrates the development of Algeria's external balance (1979–2024):

Figure(04): Algeria's External Balance (Current US Dollars)



The Source: (World Bank Data, 2026)

External balance data in Algeria (1979–2024) show a highly volatile trajectory, reflecting the strong dependence of the national economy on hydrocarbon revenues and fluctuations in global markets. In the first phase (late 1970s and early 1980s), the balance was relatively stable, with limited surpluses in some years. However, it quickly shifted into a clear deficit in the mid-1980s due to the collapse of oil prices, leading to a sharp decline in foreign revenues. This situation persisted through most of the 1990s, with deficits or small, fluctuating surpluses, despite some temporary improvements in years such as 1996 and 1997, under difficult economic and security conditions. With the beginning of the new millennium, the external balance experienced a major shift toward very large surpluses between 2000 and 2008, peaking in 2008, driven by record-high oil prices and increased exports, which strengthened the country's financial reserves. However, these surpluses declined sharply following the 2009 global financial crisis, then partially recovered before turning into a large and sustained deficit during 2014–2020 due to the collapse of oil prices and rising imports, highlighting the fragility of the external balance. With improving energy prices after 2021, the balance returned to significant surpluses, especially in 2022, before declining again in 2024 to a slight deficit. Overall, these data confirm that Algeria's external balance depends almost entirely on oil market fluctuations, making it highly vulnerable to external shocks and underscoring the urgent need to diversify exports and strengthen non-oil sectors to achieve sustainable stability.

III- Methods and Materials:

This study measured the impact of air transport on non-oil imports in Algeria during the period 1979–2024, using (ARDL) model applied in EViews 10. Four time series were considered: the first series represents the dependent variable, which is non-oil imports, while the other three represent the independent variables, namely the external balance, air cargo, and passengers transported by air. The data used in this model were collected from the World Bank data base(World Bank Data, 2026). The studied model is expressed by the following relationship:

$$Imp = \alpha + \beta_1 tc + \beta_2 tch + \beta_3 bc + \varepsilon i$$

Where:

imp : Non-oil imports (in current US dollars).

tc : Air transport – Passengers carried.

tch : Air transport – Cargo (million ton-km).

bc : External balance (in current US dollars).

$\beta_1, \beta_2, \beta_3$: represent the elasticities of air transport and the external balance, respectively.

εi : represents the random error term.

III -1 Stationary Test of Time Series

The unit root test is one of the most widely used statistical methods in time series analysis, as it is employed to verify the stability of the study's variables, determine the order of integration of each variable separately, and identify the number of differences required to make a series stationary. This is important because stationarity is a fundamental prerequisite for conducting a cointegration test. To test the stationarity of the study's time series variables, the Augmented Dickey-Fuller (ADF) test was used (Bourahla & Otmane, 2023, p. 173), as shown in the table below.

Table (01): Results of ADF Test

ADF Test			
At the first Difference	**At the LEVEL**		**Variables**
-4.105480 (0.0024)	2.135444 (0.9999)	**Intercept**	**imp**
-5.012944 (0.0013)	-0.886518 (0.9467)	**Trend and Intercept**	
-3.971166 (0.0002)	3.503334 (0.9997)	**None**	
-6.175532 (0.0000)	-2.454748 (0.1332)	**Intercept**	**bc**
-6.101798 (0.0000)	-2.414473 (0.3675)	**Trend and Intercept**	
-6.251768 (0.0000)	-2.395419 (0.0176)	**None**	
-5.004090 (0.0002)	-3.172227 (0.0285)	**Intercept**	**Tc**
-5.395467 (0.0004)	-4.125002 (0.0116)	**Trend and Intercept**	
-5.016998 (0.0000)	-0.045100 (0.6624)	**None**	
-9.973893 (0.0000)	-4.014507 (0.0031)	**Intercept**	**Tch**
-10.00347 (0.0000)	-3.942384 (0.0181)	**Trend and Intercept**	
-10.08830 (0.0000)	-1.129764 (0.2314)	**None**	

The Source: EViews Outputs

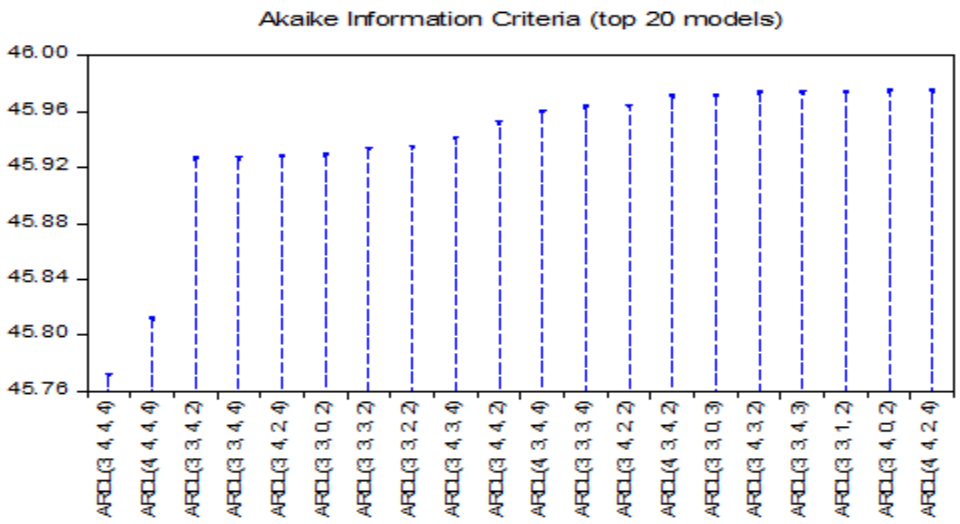
From Table 01, we observe that all the time series of the study variables are stationary at the first difference according to the ADF test, as the calculated t-value is greater than its critical value at the 5% significance level. In contrast, all the time series under study are non-stationary at levels, since the absolute value of the calculated t-statistic is smaller than the absolute critical value and is not significant at the 5% level. Therefore, after confirming that all the time series under study are

integrated of order I(1), it is possible to use the (ARDL) model to examine the relationship between air transport and non-oil imports in Algeria.

III -2 Determining the Optimal Lag Length for the Model

Prior to estimating the specified model, determining the appropriate lag structure is essential to ensure that the residuals are not affected by autocorrelation. Accordingly, the optimal lag length was selected using two key information criteria: the Akaike Information Criterion (AIC) and the Schwarz Criterion (SC) (bourahla & Otmane, 2023, p. 174). The figure below presents the results of this selection procedure.

Figure (05): Determination of Optimal Lag Lengths



The Source: EViews Outputs

As illustrated in Figure 05, out of the 20 estimated lag specifications, the ARDL (3,4,4,4) model emerges as the most appropriate for the study variables based on the Akaike Information Criterion (AIC), making it the preferred choice for estimating the long-run equilibrium relationship.

III -3 Cointegration Test Using the Bounds Testing Approach

This test is designed to examine whether a long-run relationship exists between the dependent variable, represented by non-oil imports, and the independent variables, which include air transport for passengers and cargo, as well as the external balance, using the ARDL framework. The hypotheses are formulated as follows:

- **Null Hypothesis (H_0):** No long-term relationship exists between air transport and non-oil imports.
- **Alternative Hypothesis (H_1):** A long-term relationship exists between air transport and non-oil imports.

The decision to accept or reject the null hypothesis is based on the computed F-statistic. The results of this analysis are presented in the table below.

Table(02) : Bounds Testing Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	14.23618	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

The Source: EViews Outputs

It can be observed from the table above that the F-statistic for the bounds test is 14.23618**,** which is greater than both the upper bound (I1) and the lower bound (I0) at all significance levels. This indicates the rejection of the null hypothesis H0, which states that there is no cointegration among the study variables, and the acceptance of the alternative hypothesis H1, which asserts the existence of a cointegration relationship and a long-term equilibrium relationship running from the explanatory variables to the dependent variable.

III –4 Estimation of the Autoregressive Distributed Lag (ARDL) Model

The table below illustrates the relationship between air transport and non-oil imports in Algeria (1979–2024), according to the (ARDL) model:

Table (03): Estimation of the (ARDL) Model

Dependent Variable: IMP
Method: ARDL
Date: 03/25/26 Time: 14:48
Sample (adjusted): 1983 2024
Included observations: 42 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): TC TCH BC
Fixed regressors: C
Number of models evaluated: 500
Selected Model: ARDL(3, 4, 4, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
IMP(-1)	0.896204	0.150450	5.956825	0.0000
IMP(-2)	-0.777560	0.193631	-4.015686	0.0005
IMP(-3)	0.790921	0.135877	5.820867	0.0000
TC	1346.373	559.9365	2.404511	0.0246
TC(-1)	-214.0221	551.3639	-0.388169	0.7015
TC(-2)	1841.087	624.4233	2.948450	0.0072
TC(-3)	-908.0993	763.2059	-1.189848	0.2462
TC(-4)	1795.380	789.8488	2.273067	0.0327
TCH	-40930070	65103727	-0.628690	0.5357
TCH(-1)	-34429410	70344186	-0.489442	0.6292
TCH(-2)	-1.36E+08	70326650	-1.929019	0.0662
TCH(-3)	96014943	76006166	1.263252	0.2192
TCH(-4)	-1.71E+08	72646020	-2.360048	0.0271
BC	0.185267	0.042201	4.390144	0.0002
BC(-1)	-0.053948	0.067929	-0.794173	0.4352
BC(-2)	0.352967	0.071666	4.925455	0.0001
BC(-3)	-0.025479	0.072586	-0.351026	0.7288
BC(-4)	0.143448	0.054137	2.649720	0.0143
C	-7.12E+09	6.14E+09	-1.159846	0.2580

R-squared	0.995548	Mean dependent var	3.06E+10
Adjusted R-squared	0.992063	S.D. dependent var	2.03E+10
S.E. of regression	1.81E+09	Akaike info criterion	45.77178
Sum squared resid	7.52E+19	Schwarz criterion	46.55787
Log likelihood	-942.2075	Hannan-Quinn criter.	46.05992
F-statistic	285.7213	Durbin-Watson stat	2.004691
Prob(F-statistic)	0.000000		

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

The Source: EViews Outputs

The table above, which reports the results of estimating the (ARDL) model, shows that the coefficient of determination (R^2) is 99%. This indicates that the independent variables air transport and the external balance account for 99% of the variation in non-oil imports, while the remaining 1% may be attributed to the margin of error, omitted variables, or measurement inaccuracies. Additionally, the computed F-statistic is 285.7213 with a p-value of 0.000000, demonstrating statistical significance and confirming that the model is well-specified and robust as a whole.

Upon testing the model's validity (see Appendix No. 01) in Algeria, the results of all diagnostic tests confirmed the acceptance of the null hypothesis, indicating that the studied model as a whole is valid and of good quality.

III –5 Results and discussion:

To estimate the (ARDL) model and examine both the long-term and short-term relationships, the process was carried out in two stages as follows:

III –5–1 Estimation of the Long-Term Relationship

Based on the long-term ARDL model results (See Appendix No. 2) , a positive and significant relationship is observed between air transport (number of passengers) and non-oil imports. This fundamentally reflects that the movement of individuals is not merely a transportation activity, but a composite indicator of the level of economic and social openness and the dynamism of domestic demand. An increase in the number of passengers is often associated with higher personal incomes, an expanding middle class, and intensified external exchanges for purposes such as tourism, work, medical treatment, or education. All these factors indirectly stimulate demand for foreign goods, either through direct consumption (goods brought by or requested by travelers) or by encouraging the local market to import products that satisfy more open consumption patterns and tastes. Therefore, the statistical significance of this variable reflects its role as an important channel through which openness translates into imports. Regarding air cargo, the lack of statistical significance, despite the negative sign, can be explained by the weak structural role of this type of transport in the Algerian economy. Air cargo is usually used for high-value or time-sensitive goods, whereas Algeria relies more heavily on maritime transport for importing essential and capital goods. Thus, changes in air cargo activity do not accurately reflect changes in total non-oil imports. The negative sign can be economically interpreted as indicating that improved cargo activity may sometimes be associated with increased exports or a reallocation toward higher-value domestic products, which may partially reduce the need for imports; however, this effect is limited and unstable, explaining its lack of significance. Concerning the external balance, its statistical insignificance, despite a positive relationship, reflects the specific nature of the Algerian economy, where improvements in the external account do not always translate into proportional import behavior. Although external surpluses (mainly from oil exports) provide foreign currency liquidity, the allocation of these resources toward imports is subject to political and regulatory considerations, such as import rationing policies or administrative constraints. Therefore, the external balance may improve without a corresponding immediate rise in imports, or vice versa. Nevertheless, the positive coefficient remains economically logical, as it indicates that the availability of external resources ultimately expands the financial capacity for imports, even if this effect does not appear statistically consistent.

Overall, these results suggest that the main determinant of non-oil imports in Algeria is not solely factors related to external trade or logistics, but is more closely linked to domestic factors such as consumer demand, income levels, and social openness, which are indirectly expressed through air passenger transport. This highlights the continued dominance of the consumption-driven nature of the economy, as opposed to productive links that could reduce dependence on foreign goods.

III –5–2 Estimating the Short-Term Relationship

The results of the short-term error correction model (See Appendix No 3) reflect a set of deep economic implications regarding how the Algerian economy responds to shocks and changes in demand and external openness. The negative and significant error correction coefficient (-0.090435) carries important meaning, as it confirms the existence of a long-term equilibrium relationship between the variables and indicates that the economy does not immediately return to balance after a disturbance. Instead, adjustment occurs gradually and at a relatively slow pace, with only about 9% of the disequilibrium corrected annually. This implies that any shock (such as a sudden increase in imports or a change in air transport) may take several years to be fully absorbed, reflecting a degree

of structural rigidity in the economy, whether due to slow policy adjustments or limited flexibility in the productive sector. Regarding the short-term relationship between air passenger transport and non-oil imports, the continued positive and significant association indicates that the effect of this variable is not only structural and long-term but also manifests quickly in the short run. An increase in the number of passengers directly raises demand for imported goods, either through direct consumption (e.g., goods brought by individuals) or indirectly via market effects (e.g., increased demand for foreign products). This illustrates the rapid transmission of economic openness into import behavior, which explains the positive coefficient, even if it is smaller than in the long term, indicating that the effect accumulates over time. For air cargo, the negative short-term relationship can be interpreted as increased cargo activity potentially being linked to export operations or the reallocation of resources toward domestic production, which reduces immediate import needs. It may also reflect partial substitution of imports, with greater reliance on domestic production or alternative transport channels (especially maritime transport). However, this effect remains limited and unstable, explaining its weak or inconsistent influence on imports. Concerning the external balance, its statistical significance in the short term, with a positive sign, indicates that improvements in the external account often resulting from rising oil prices rapidly expand the capacity for imports. In other words, the availability of foreign currency translates almost directly into increased imports, reflecting the Algerian economy's tendency to channel external surpluses toward consumption or import expenditure rather than productive investment. Nevertheless, the weaker effect compared to the long term suggests that this impact may be temporary and more closely tied to economic cycles than to a stable structural relationship.

Overall, these results indicate that the Algerian economy reacts relatively quickly to changes in certain variables (such as air transport and the external balance) in the short term but requires more time to restore equilibrium, highlighting structural rigidities that limit the speed of adjustment. They also confirm that non-oil imports are primarily influenced by demand and openness factors, while the impact of productive and logistical variables remains limited, reinforcing the persistence of external dependence and weak economic diversification.

IV- Conclusion:

The study's findings indicate that air transport plays a pivotal and multifaceted role in enhancing non-oil imports in Algeria. Passenger air traffic is more than just a means of transportation; it serves as an economic and social indicator reflecting openness to global markets and domestic consumer dynamics. An increase in the number of passengers is directly linked to higher demand for imported goods, whether for personal use, tourism, education, or work. This reflects the expansion of the middle class, rising purchasing power, and a shift in consumption patterns toward a wider variety of foreign products. Moreover, air transport activates logistics chains and infrastructure, including modern airports and advanced cargo networks, which facilitate the movement of high-value goods, accelerate their arrival in local markets, and stimulate investment in production and service sectors connected to foreign trade. Although air freight has a limited statistical impact on overall imports, it remains a strategic tool for transporting time- and value-sensitive goods, such as industrial equipment, electronics, and high-cost raw materials, allowing them to reach markets quickly and efficiently. The study also highlights that the effectiveness of air transport is closely linked to external financial resources, particularly foreign currency revenues from hydrocarbon exports. This implies that fluctuations in oil prices directly affect the financial capacity for imports and, consequently, the level of economic openness. Therefore, developing both passenger and cargo air transport is not merely a matter of mobility; it is

a strategic tool to promote trade openness, stimulate consumption, and expand the national economy beyond hydrocarbon dependency, placing air transport at the core of future economic policies aimed at sustainable diversification and structural trade stability.

IV-1 Study Results:

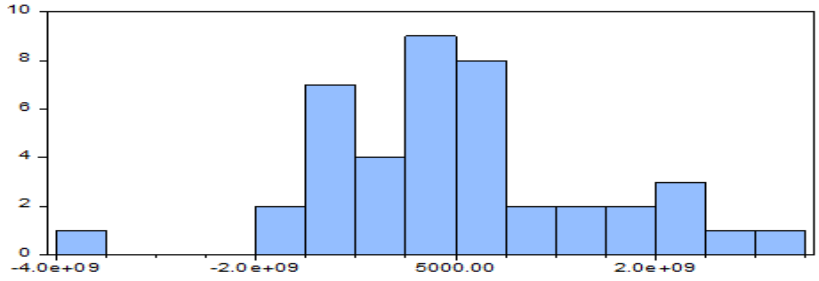
- The study showed that increased air passenger traffic is positively associated with higher non-oil import volumes, representing the reflection of economic openness and rising consumer demand for imported goods, whether for luxury or commercial purposes.
- Although air freight is important for transporting high-value and time-sensitive goods, such as industrial equipment and electronics, its impact on total non-oil imports was limited and less clear.
- Air transport, especially passenger traffic, serves as an effective tool to support economic openness, stimulate consumption, and promote economic diversification away from reliance on hydrocarbons.

IV-2 Study Recommendations:

- Air transport infrastructure in Algeria should be enhanced by improving airports, increasing flight frequencies, and developing air freight networks to facilitate the movement of high-value goods.
- International flights should be expanded to increase passenger traffic and strengthen non-oil trade in Algeria.
- Innovation and advanced logistics services should be encouraged, particularly in high-tech goods sectors, to facilitate imports and develop related local industries.

V- Appendices:

Appendix (1)



Series: Residuals	
Sample 1983 2024	
Observations 42	
Mean	-7.05e-06
Median	-1.64e+08
Maximum	3.23e+09
Minimum	-3.68e+09
Std. Dev.	1.35e+09
Skewness	0.144380
Kurtosis	3.357762
Jarque-Bera	0.369907
Probability	0.831143

Breusch-Godfrey Serial Correlation LM Test:

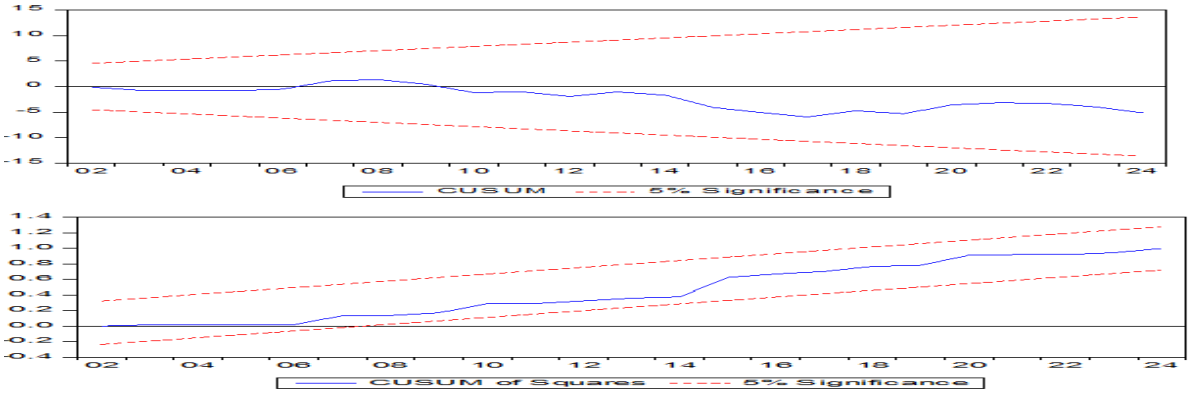
F-statistic	0.119545	Prob. F(2,21)	0.8879
Obs*R-squared	0.472796	Prob. Chi-Square(2)	0.7895

Heteroskedasticity Test: ARCH

F-statistic	0.109059	Prob. F(1,39)	0.7430
Obs*R-squared	0.114332	Prob. Chi-Square(1)	0.7353

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.724574	Prob. F(18,23)	0.7551
Obs*R-squared	15.19818	Prob. Chi-Square(18)	0.6483
Scaled explained SS	5.373021	Prob. Chi-Square(18)	0.9981



Appendix (2):

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TC	42690.31	8569.306	4.981770	0.0000
TCH	-3.17E+09	1.92E+09	-1.653161	0.1119
BC	6.659716	3.613053	1.843238	0.0782
C	-7.88E+10	2.93E+10	-2.691648	0.0130

EC = IMP - (42690.3124*TC -3167497053.7902*TCH + 6.6597*BC
-78784492381.7596)

Appendix (3)

ARDL Error Correction Regression
Dependent Variable: D(IMP)
Selected Model: ARDL(3, 4, 4, 4)
Case 2: Restricted Constant and No Trend
Date: 03/25/26 Time: 14:50
Sample: 1979 2024
Included observations: 42

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IMP(-1))	-0.013360	0.124697	-0.107142	0.9156
D(IMP(-2))	-0.790921	0.125239	-6.315293	0.0000
D(TC)	1346.373	314.0633	4.286949	0.0003
D(TC(-1))	-2728.367	398.7546	-6.842221	0.0000
D(TC(-2))	-887.2803	410.1719	-2.163191	0.0412
D(TC(-3))	-1795.380	448.9269	-3.999269	0.0006
D(TCH)	-40930070	52130843	0.000000	0.0000
D(TCH(-1))	2.11E+08	62101156	0.000000	0.0000
D(TCH(-2))	75433171	59454889	0.000000	0.0000
D(TCH(-3))	1.71E+08	53318804	0.000000	0.0000
D(BC)	0.185267	0.037286	4.968824	0.0001
D(BC(-1))	-0.470955	0.065203	-7.222882	0.0000
D(BC(-2))	-0.117968	0.044144	-2.672362	0.0136
D(BC(-3))	-0.143448	0.044938	-3.192151	0.0041
CointEq(-1)*	-0.090435	0.009893	-9.141127	0.0000

R-squared	0.888248	Mean dependent var	9.88E+08
Adjusted R-squared	0.830303	S.D. dependent var	4.05E+09
S.E. of regression	1.67E+09	Akaike info criterion	45.58131
Sum squared resid	7.52E+19	Schwarz criterion	46.20190
Log likelihood	-942.2075	Hannan-Quinn criter.	45.80878
Durbin-Watson stat	2.004691		

* p-value incompatible with t-Bounds distribution.

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