PRACE NAUKOWE
Uniwersytetu Ekonomicznego we Wrocławiu
RESEARCH PAPERS
of Wrocław University of Economics and Business

Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu
Research Papers of Wroclaw University of Economics and Business
Year 2025, Vol. 69, No. 4
ISSN 2392-0041
journals.ue.wroc.pl/pn

Measuring the Impact of Tourism Revenue on Economic Growth in Algeria during the Period 2005-2023 Using the ECM Error Correction Model

Mouna Bessouyah

Relizane University

e-mail: mouna.bessouyah@univ-relizane.dz

ORCID: 0000-0002-6981-7145

Yassine Mimouni

Relizane University

e-mail: yassine.mimouni@univ-relizane.dz

ORCID: 0000-0002-9031-8682

Quote as: Bessouyah, M., & Mimouni, Y. (2025). Measuring the Impact of Tourism Revenue on Economic Growth in Algeria during the Period 2005-2023 Using the ECM Error Correction Model. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *69*(4), 13-29.

DOI: 10.15611/pn.2025.4.02

JEL: L83, I23

Abstract

Aim: This study aimed to measure the impact of tourism revenue on Algeria's economic growth during the period 2005-2023.

Methodology: The author used the enterprise content management error correction model, with the aim of testing the long-term causal link between tourism revenue and economic growth, and testing joint integration.

Results: After testing the stability of time chains, the study variables were found to be first-class reliable. The results of the estimates showed a causal link between the two variables in the short term. After testing the significance of the parameters, CointEq error correction coefficient was found to be negative and ethical. This explains the long-term balance between the positive impact study variables for both GDP and the change in tourism revenue.

Implications and recommendations: It was possible to propose the following recommendations: promoting the community's tourism culture, developing the tourism infrastructure, and engaging with the private sector and launching tourism projects.

Originality/value: This issue is of great importance due to the increased interest in the tourism sector in financing the economy, considered to be an alternative to petroleum wealth.

Keywords: tourism, tourism revenue, economic growth, causal relationship, error correction model

1. Introduction

Over the past two decades, tourism has become one of the most dynamic pillars of the world economy, rebounding strongly after the shock of the COVID-19 pandemic and returning to (and in many destinations surpassing) pre-pandemic activity. The latest UN figures concerning tourism estimated that international arrivals in 2024 reached about 99% of 2019 levels (≈1.4 billion trips), underlining the sector's resilience and renewed role in driving output and employment (The World Tourism Organization, 2025).

This macro momentum was mirrored in aggregate economic accounts: the World Travel & Tourism Council (WTTC) reported that the sector contributed around US$10 trillion in 2023 (9.1% of global GDP) and was on track to exceed US$11 trillion (approximately 10% of GDP) in 2024, supporting roughly 330-357 million jobs worldwide. Such scale effects demonstrate why many countries–especially resource-rich or diversifying economies–treat tourism as a strategic lever for growth, foreign exchange, and spatial development (WTTC, 2024).

Empirically, the 'tourism-led growth' (TLG) hypothesis has been tested with increasingly rich datasets and methods. Recent global and regional studies, using CS-ARDL**,** panel quantile ARDL**,** mixed-frequency Granger**,** wavelet coherence, and panel cointegration/VECM, generally found that tourism activity and revenue are positively associated with output, with effect sizes mediated by institutions, openness, and development stage. New evidence for 2024-2025 confirms TLG in the short and long-term settings (CS-ARDL across 100+ countries), uncovers heterogeneous effects across the growth distribution (panel quantile ARDL), and emphasises that higher tourism openness and institutional quality amplify gains (Alqaralleh et al., 2025).

Moreover, a growing body of work suggests bidirectional dynamics ('economy-driven tourism growth'), where income expansions, infrastructure, and governance upgrades stimulate tourism flows–implying feedback loops rather than a single causal channel. This line of research strengthens the case for models that allow asymmetry, heterogeneity, and feedback, complementing traditional ECM/VECM with quantile, time-frequency, and regime-switching approaches (Roy & Medhekar, 2025).

Against this global backdrop, Algeria has begun to treat tourism as a diversification axis, alongside hydrocarbons. WTTC's country accounts noted rising visitor exports and projected continued increase in arrivals and spending through the next decade, contingent on investment, connectivity, and product development. Computable approaches based on Algeria's Social Accounting Matrix (SAM) further indicated sizeable inter-industry spillovers (hospitality, transport, construction, energy, agri-food), pointing to meaningful multiplier effects from calibrated tourism-demand shocks (Zerkak & Souman, 2024).

Regionally comparable studies using ARDL/cointegration for North Africa, the Mediterranean, and broader emerging markets found that tourism's contribution is strongest when accompanied by infrastructure investment, labour-market depth and policy credibility, while shocks (energy prices, pandemics) and leakages can mute short-term effects—lessons directly relevant to Algeria's policy sequencing (Hussain & Nawaz, 2024).

Building on these insights, this paper revisits Algeria in the period 2005-2023, to test the long and short-term links between tourism revenue and economic growth using an ECM/VECM framework.

Positioning the analysis within the contemporary literature allowed to (i) benchmark Algeria's experience against global post-pandemic dynamics, (ii) interpret the results alongside newer methods that capture heterogeneity and feedback, and (iii) derive policy implications consistent with evidence on openness, governance, and investment complementarities.

Algeria, just like other countries, has excellent tourism assets that qualify it to be a first-class tourist country, however these assets have not been properly exploited by the authorities. This is due to the dependence of the Algerian economy mainly on oil wealth, whilst neglecting other sectors despite the possibility of developing them. With the current situation in the world in general, and Algeria in particular, related to the pandemic and the resulting decline in oil prices, the growth rates of many economic indicators, the most important of which is economic growth, have decreased. This made the Algerian government look for other alternatives to finance its economic activity, hence driving it to internal tourism, especially desert tourism. Although this did not reach the required level, yet it is striving to provide mechanisms that suit its components. Based on the above, the study attempted to answer the following question: What was the impact of tourism revenue on economic growth in Algeria during the period 2005-2023?

1.1. Rationale for Selecting Algeria as a Case Study

The choice of Algeria as a case study was motivated by several interrelated economic, structural, and policy considerations.

First, Algeria represents a hydrocarbon-dependent economy where oil and gas account for more than 90% of export revenue and about 40% of its GDP. This reliance makes the economy highly vulnerable to external shocks, such as volatility in global oil prices and the COVID-19 pandemic, which exposed the fragility of Algeria's growth model (WTTC, 2024). In this context, tourism development is increasingly viewed as a strategic avenue for economic diversification.

Second, Algeria possesses significant but underexploited tourism potential. As the largest country in Africa, it offers a wide range of natural and cultural resources, including the Sahara desert, Mediterranean coastline, and multiple UNESCO World Heritage sites. Despite these assets, Algeria attracts far fewer international tourists compared to its regional peers such as Morocco, Tunisia, and Egypt (Zerkak & Souman, 2024). This contrast between potential and actual performance makes Algeria a particularly relevant case for testing the tourism-led growth hypothesis.

Third, recent policy initiatives underline the timeliness of this research. The Algerian government has introduced reforms and investment plans to promote domestic and desert tourism as an alternative to hydrocarbons (Rashi, 2016). Evaluating the economic impact of tourism in Algeria is therefore not only academically significant, but also directly relevant to the ongoing policy debate on sustainable diversification strategies.

Finally, from a regional perspective, most empirical research in North Africa has focused on Morocco, Tunisia, and Egypt (Huseynli, 2022; Rasool et al., 2021). Algeria, by contrast, remains underrepresented in the literature despite its unique characteristics. Thus analyzing Algerian context helps to fill this gap and provides lessons for other resource-dependent economies seeking to strengthen non-hydrocarbon growth sectors.

2. Literature Review

2.1. Relationship between Tourism and Economic Growth

According to many explanatory theories, tourism plays an important role in economic activity by affecting many economic sectors. The tourism sector is considered a key factor that provides a set of

reasons to demonstrate that tourism investment is a positive factor in economic growth, as it generates foreign exchange revenue and facilitates the use of resources that are in line with the available factors of production, in addition to encouraging improvement in infrastructure and generalising the benefit to tourists through the provision and transfer of technological and administrative skills in the economy (İmamoğlu et al., 2022), as the relationship between tourism in general and tourism investment in particular, and economic growth has been addressed by many theories such as (Rashi, 2016), showing that over the last few decades there has been a surge in the research related to tourism-growth nexus. The importance of growth and development and its determinants has been studied extensively both in developed and developing countries (Huseynli, 2022). The extant literature has recognised tourism as an important determinant of economic growth. The importance of tourism has grown exponentially, owing to its manifold advantages in the form of employment, foreign exchange, production, household income and government revenue through multiplier effects, improvements in the balance of payments and growth in the number of tourism-promoted government policies (Rasool et al., 2021). International trade theory links the contributions of tourism to economic growth, and within its framework, Lucas's model of internal growth was applied to explain the impact of the tourism sector on economic growth (Alalawneh et al., 2021). It was concluded that tourism investment promotes economic growth if the flexibility of substitution between them is less than 1 (Nissan et al., 2010).

The Keynesian multiplier theory emphasizes that high expenditure increases employment opportunities and income, as tourism investment generates multiplier effects on income and employment. However, this framework is a static analysis that does not allow for deducing long-term effects, called the tourism multiplier effect, whose value depends on the nature of the relationship and the degree of interdependence between the tourism sector and other economic sectors (Morsi, 2001). The theory of internal growth revealed that when applied to the tourism sector, it tends to emphasise the virtue of technology sectors over their availability of the most promising opportunities for long-term growth compared to other sectors. One of the most cited theories about the tourism sector recommends that technology provides greater opportunities for economic growth in the long term compared to tourism, as it relies on the premise of tourism-led growth, i.e. that tourism will increase incomes (Pigliaru et al., 2007). In the same context, international tourism contributes to increasing income in at least two additional ways, as shown in the export-led growth hypothesis, as firstly it increases efficiency by promoting competition between international tourism companies and destinations and, at the same time, by facilitating the exploitation of economies of scale in local institutions. Many studies have confirmed that economic growth contributes to the emergence of tourism in some countries and the growth of tourism markets, as new countries have emerged on the tourism market arena after recording rapid growth. For example, Germany has become the first economic and commercial power in Europe, happy to become one of the main tourist destinations, with the same phenomenon occurring in Japan, which achieved high rates of economic growth and is also one of the most important countries receiving tourists in the region, where high income is one of the factors stimulating tourism demand. The following figure illustrates the relationship between tourism and economic growth (Shaqaqil, 2020). Focusing on studies worldwide, using the case of Mediterranean countries, Tugcu found a substantial and favourable correlation between tourism and economic growth. The research confirmed the relationship between economic growth and tourism studied for several groups of countries and nations. The relationship between travel and economic growth varies per country (Huseynli, 2024), although European nations can experience economic growth through travel to European, Asian, and African nations. Most recent research by Enilov and Wang examined the causal relationship between foreign tourist arrivals and economic growth in 23 developing and developed countries in 1981-2017. Their study employed a bootstrap mixed-frequency Granger causality approach using a rolling window technique to evaluate the approach’s stability and persistency over time concerning economic growth. The findings demonstrated that – in contrast to wealthy nations – the tourism industry in developing nations continues to be a major contributor in future economic growth (Wijesekara et al., 2022).

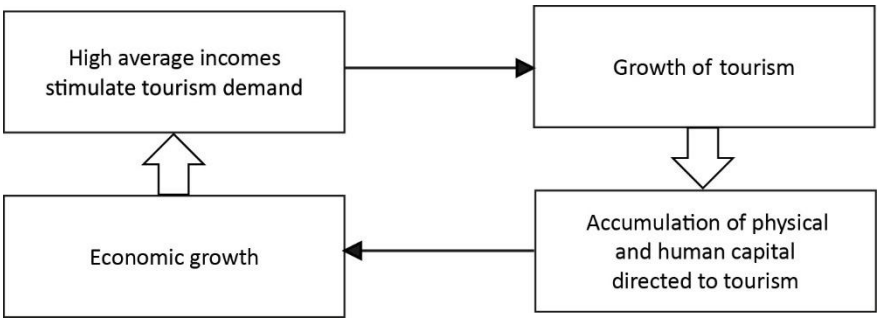
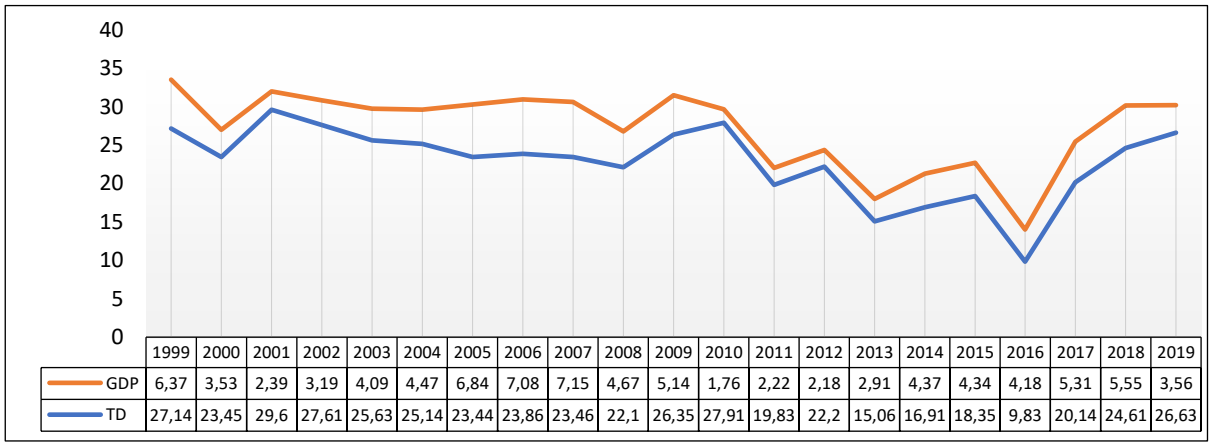


Fig. 1. Relationship between tourism and economic growth

Source: (Brida et. al, 2020).

Based on the above figure, it can be said that the rise in national income is an incentive to increase allocations to the active sectors of the economy, including the tourism sector, as the accumulation of the tourism capital allows for the promotion of internal tourism in particular. This stimulates the sector to new and larger investments in the sector, which can increase the competitiveness of tourist destinations and enhance their ability to bring in more foreign tourists. This makes the relationship between tourism, the accumulation of tourism capital and national output an interconnected circle, as an improvement in any of these three variables will lead directly to the improvement of other indicators, following a continuous retrogressive cycle as long as the economic and political conditions are stable. This makes the tourism sector very central and can promote economic growth and strengthen it.



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GDP	6,37	3,53	2,39	3,19	4,09	4,47	6,84	7,08	7,15	4,67	5,14	1,76	2,22	2,18	2,91	4,37	4,34	4,18	5,31	5,55	3,56
TD	27,14	23,45	29,6	27,61	25,63	25,14	23,44	23,86	23,46	22,1	26,35	27,91	19,83	22,2	15,06	16,91	18,35	9,83	20,14	24,61	26,63

Fig. 2. Development of tourism revenue and economic growth rates in Algeria during the period 1999-2023

Source: own study based on (World Bank Group).

The vertical axis in Figure 2 shows the value of tourism revenue in Algeria in US dollars, during the years from 1999 to 2023, illustrated on the horizontal axis. The above figure shows that tourism revenue in Algeria was low and unstable, fluctuating from year to year, whilst tending to decline during the last ten years, especially in 2009-2017 compared to previous years. This was due to the global financial crisis that affected global tourism in general. The weakness of the tourism revenue can be explained by the 'leakage' of some of it into the parallel market, in addition to the nature of the tourists coming to Algeria (mostly of Algerians in the diaspora, whose spending was low compared to foreign arrivals, as they are often received by their family , whilst the ownership of private housing in Algeria does not exceed 1.6%). This percentage is very small considering the tourism components of Algeria, which qualifies the sector as secondary the Algerian economy.

3. Methodology

3.1. Sample and Data Collection

This study was conducted to examine the impact of changes in tourism revenues on Algeria's rate of economic growth during the period 2005-2023, including the data for the pandemic period, obtained from the National Statistical Database of Algeria. Due to the development of Algerian tourism in that period and its positive impact on the national economy, it is an appropriate context for this study. The ECM error correction model was used as suitable for the study, following the joint integration test. A long-term balance relationship was found, allowing to study the effect and causal relationship between the two variables using Eviews10.

$$GDP = F(TD)$$

$$id = \beta 0 + \beta 1 inf + \varepsilon t \quad (1),$$

where:

GDP – stands for gross domestic product,
TD – tourism revenue,
β0 β1 – the parameters of the model,
εt – random error.

Table 1. Study Variables

Variable	Significance	Code	Data source
Economic growth	Gross domestic product	GDP	World Bank
Tourism Revenue	Volume of tourism revenue expressed as a percentage of GDP	TD	World Bank

Source: own elaboration.

4. Results

4.1. Testing the Stability of Time Series of Study Variables

In order to identify the degree of integration of the time series of the study variables by verifying the absence of the single root, the ADF test was applied and the following table shows the results of its application.

Table 2. Unit Root Test Results Using ADF

Variable	1st Differences								
	Intercept			Trend and Intercept			None		
	ADF	Level 5%	Prob	ADF	Level 5%	Prob	ADF	Level 5%	Prob
GDP	-8.671765	-3.119910	0.0000	-8.173718	-3.828975	0.0001	-8.368243	-1.970978	0.0000
TD	-3.402021	-3.119910	0.0003	-3.174717	-3.828975	0.1318	-3.514257	-1.970978	0.0020

Source: own elaboration based on (Eviews10).

Table 3. Unit Root Test Results Using the Phillips-Perron Test

Variable	1st Differences								
	Intercept			Trend and Intercept			None		
	ADF	Level 5%	Prob	ADF	Level 5%	Prob	ADF	Level 5%	Prob
GDP	-5.345632	-4.234531	0.0002	-6.654324	-3.562341	0.0004	-8.123226	-2.174354	0.0000
TD	-4.234435	-2.426786	0.0001	-3.213457	-3.828975	0.0543	-3.514257	-2.584632	0.0000

Source: own elaboration based on (Eviews10).

Based on the unit root test results for the time series described in the above tables and through the ADF and PP tests, it was found that the series associated with the variable GDP was stable at the first difference, i.e. the value of 8.67 = T-Statistic) in absolute value (greater than the table value 3.11), and this was shown by the probability of this test (*Prob* = 0.0000), lower than 0.05. Therefore through this model it can be said that the series does not contain a unit root and thus it is stable, namely integrated from grade 1, i.e. I(1).

For the series associated with the TD variant, it was unstable at None in both tests. For example, in the ADF test it was found that the value of 3.17 = T-Statistic (in absolute terms), which was lower than the scheduled value of 3.82 as evidenced by the probability of testing *Prob* = 0.1318, which was greater.

Table 4. Unit Root Test Results Using ADF Following Differences

Variables	1st Differences								
	Intercept			Trend and Intercept			None		
	ADF	Level 5%	Prob	ADF	Level 5%	Prob	ADF	Level 5%	Prob
DTD	-3.894109	-3.175352	0.0161	-3.734432	-3.933364	0.0656	-4.134668	-1.977738	0.0007
DDTD	-4.441585	-3.2112696	0.0081	-4.311937	-4.008157	0.0341	-4.723304	-1.982344	0.0003

Source: own elaboration based on (Eviews10).

Table 5. Unit Root Test Results Using PP Following Differences

Variable	1st Differences								
	Intercept			Trend and Intercept			None		
	ADF	Level 5%	Prob	ADF	Level 5%	Prob	ADF	Level 5%	Prob
DTD	-4.402654	-2.325754	0.0001	-3.453721	-3.432765	0.0004	-4.254672	-2.413852	0.0000

Source: own elaboration based on (Eviews10).

After applying first-class differences according to the ADF test of the TD series, and based on the results obtained, it was noted that the *Prob* = 0.0656 value was greater than 0.05, indicating that the chain was not yet stabilised.

After making TD grade II commissions, and based on the results obtained, it was noted that the Prob value was important in the three models, hence it can be said that the chain was stable at the first difference, namely incorporated from the first class, i.e. I (1) As for the PP test, the TD series stabilised at the first difference.

Through the ADF and PP tests, both series can be said to be equally integrated and graded.

4.2. Granger Causality Test

The Granger Causality Test refers to the study of the trend of the relationship between GDP and tourism revenue shown in Table 6.

Table 6. Granger Causality Test

Direction of causation	F-Statistic	PROB
GDP does not Granger Cause DDTD	1.56389	0.0240
DDTD does not Granger Cause GDP	2.67645	0.1476

Source: own study based on the outputs of (Eviews10).

- Test (1) checks the causation of GDP on DDTD where *Prob* = 0.0240, and therefore rejects the zero hypothesis, namely that GDP causes DDTD from which it can be argued that there is a causal link to GDP on tourism revenue.
- Test (2) checks the causation of DDTD on GDP, noting from the results that *Prob* = 0.1476 and therefore accepting the zero hypothesis, namely that DDTD does not affect GDP and from which it can be said that there is no causal link to GDP in tourism revenue.

Thus, it was concluded that there is a one-way causal link between GDP and tourism revenue.

4.3. Johansson's Integration Relationship Determination Test

After verifying that the two series (GDP, DDTD) were complementary of the first degree I (1), the study used the Johansson -Johansen Juselius test for joint integration, in order find whether there was joint integration, and clarification if there was a long-term complementary relationship as shown in Table 7.

Table 7. Co-integration Test Results

PROB**	0.05 Critical Value	Trace Statistic	Eigenvalue	Hypothesised
01 99?	15.49471	18.09211	0.296605	None
0.0133	3.841465	6.129684	0.164968	Atmost 1 *
Trace test indicates NO cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
PROB**	**0.05 Critical Value**	**Max-Eigen Statistic**	**Eigenvalue**	**Hypothesised**
1121	14.26460	11.96243	0.296605	None
0.0133	3.841465	6.129684	0.1644968	Atmost 1 *
Trace test indicates NO cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

Source: own study based on the outputs of (Eviews10).

Based on these results, it became clear that:

- when None* and the result of the first test was significant, i.e. the value of *Prob* = 0.0199, the zero hypothesis was rejected (there was no long-term equilibrium relationship) and the alternative hypothesis was accepted. Therefore it can be said that there was a long-term balance between the earnings of the sector and economic growth,
- when Atmost 1 *, this test was not significant with *Prob* = 0.0133. Hence the zero hypothesis was accepted, namely that there was at least one long-term equilibrium relationship.

Thus one can conclude that the existence of an equilibrium relationship enables to estimate the ECM model.

Johansson's Joint Integration Test illustrated the long weighting relationship between tourism revenue and economic growth, which have helped to support Algeria's economy. Due to the challenges faced by the government during this period, especially with regard to the COVID-19 crisis, the volume of tourism revenue has fallen. Even the growth rates have declined, yet the government managed to withstand the global crisis and provided many services in order to maintain the pace of growth.

4.4. Determine the Delay Scores for the Model

In order to estimate the var model, the criteria AIC and SC were used, with the aim of determining the optimal slowdown periods (see Table 8).

Table 8. Model Delay Score Results

HQ	SC	AIC	FPE	LR	LOGL	Lag
2.6115403	3.633587	2.633268	0.047745	NA	-15.11624	**0**
2.386237*	2.720183*	2.475563*	0.044299*	1.485117	-14.16847	**1**
3.049246	2.910139	3.104841	0.077616	1.920837	-6.091156	**2**

Source: own study based on the outputs of (Eviews10).

From theabove table which represents the criteria for determining the delay periods of the model, and according to the AIC and SC standards, it was clear that the optimal number of delays for the study variables was 1, i.e. *P* = 1. Thus it can be said that one can estimate the VECM model with an equilibrium relationship (1) and a delay period (1).

4.5. VECM Model Estimation

After confirming the stability of the time series and determining the degree of delay, the author estimated the var model through the co-integration test in order to verify the existence of co-integration in this study – Table 9 shows the results.

Table 9. VECM Error Correction Model Estimation Results

CointEq1		**Cointegration Eg**
1.000000		**GDP(-1)**
-15.221080 (2.68053) [-5.67455]		**TD(-1)**
5.716107		**C**
D(TD)	D(GDP)	**Error Correction**
0.089363 (0.02045) [4.37014]	-0.213708 19990.00 [1.06907]	**CointEq1**
-0.067652 02229 [-3.03493]	-0.871479 (0.21792) [-3.99913]	**D (GDP (-1))**
-0.067652 02229 [-3.03493]	4.839776 (2.33542) [2.072334]	**D (TD (-1))**
-0.025505 (0.033476) [-073379]	-0.404907 (0.33979) [-1.19162]	**C**

Source: own study based on the outputs of (Eviews10).

***Lm Test*:** In order to verify that there were no problems with the self-correlation of the study model, the var Residual Serial Correlation LM Test was carried out (see Table 10).

Table 10. Residual LM Test Results

PROB	**LM-Stat**	**Lags**
0.6713	2.352073	1
8240	1.514663	2
5651	2.956933	3
3245	4.655890	4
3521	4.420383	5
3484	4.451097	6

Source: own study based on the outputs of (Eviews10).

Based on these results, it was clear that all the probabilities (Prob) were immaterial (greater than 0.05) and therefore the null hypothesis was accepted that there was no self-correlation between errors (the others were not self-correlated).

4.6. VECM Validity Test

Homogeneity test was carried out in order to find out whether the study model was affected by heterogeneity, hence the heteroskedasticity test was carried out.

Table 11. Heterogeneity Test

PROB	**df**	**Chi-sq**
2172	18	22.34016

Source: own study based on the outputs of (Eviews10).

Thus it was found that when the prob value of Ch-Sq was 0.2172, greater than 0.05 (non-significant), and therefore the zero hypothesis was accepted, namely that the series of residues had a homogeneous variation. Therefore it can be said that the estimated model had neither a heterogeneity problem nor a self-correlation problem.

4.7. Unit Root Test

This test was performed to ensure the stability of the model as shown in Figure 3.

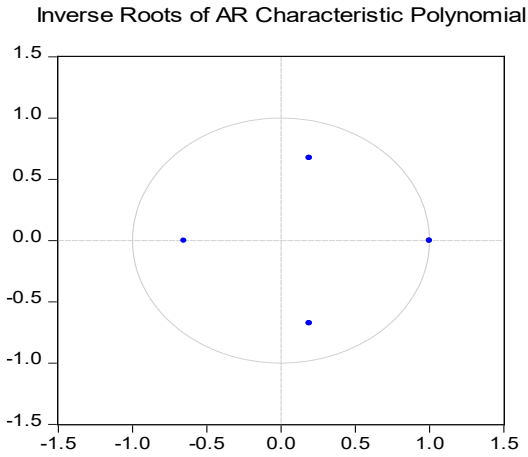


Fig. 3. Unit Root Test Results

Source: own study based on the outputs of (Eviews10).

Based on these results, it was found that the VECM model meets the conditions of stability, and since the roots are within the critical limits, the model is stable.

4.8. Testing the Significance of the Milestones

Table 12. Study Milestones Significance Test

PROB	**T-Statistic**	**Std.Error**	**Cofficient**	
0.02992	1.069065	0.199902	-0.213708	**C 1**
Determinant Residual Covariance : 0.009820				
Equation : *D*(*GDP*) = *C*(1) * (*GDP* (-1) -15.2108019667TD* (-1) +5.716172658)+ *C*(2) **D*(*GDP* (-1)) +*C*(3) **D*(*TD* (-1)) + *C*(4)**				
$200,000	**Meandependent var**	0.660521		R-squared
1.758889	**S.D. dependent Var**	0.547362		Adjusted R2
12.60287	**Sumsquaredresid**	1.183351		S.E. of Regression
		1.805535		Durbin-Watson stat

Source: own study based on the outputs of (Eviews10).

Through the estimation results in the above table, showing the results of estimating the error correction model VECM, it became clear that after estimating the error correction model CointEq was negative(0.213708), and significant *Prob* = 0.02992, explained by the existence of the long-term equilibrium relationship between the variables under study, i.e. in the long term, tourism revenue affected 21% of the GDP changes, and any imbalance that occurred at the level of one of the two variables would be corrected by this percentage in order to maintain the long-term equilibrium.

4.9. Wald Test

Using this test the significance of the landmarks was tested in the short term, i.e. the possibility of the absence of the impact of tourism revenue on GDP was tested in one delay for the short term.

Table 13. WALD Results (Short-Term Significance of Milestones)

Probability	df	Value	Test Statistic
0.0001	3	21.25673	Chi-Square

Source: own study based on the outputs of (Eviews10).

Based on the above table, which shows the results of Wald test (the significance of the milestones in the short term), it became clear that

– the value of *Prob* = 0.0001 was significant (less than 0.05), which means that there could be no landmarks for tourism revenue in the GDP equation.

4.10. Shock Analysis

In order to follow the timeline of the shocks that occur at the random error level, and to which the study variables are exposed, and the way to respond to the latter as the change in the value of the standard deviation to one, the two following curves show the results of applying this test after receiving both tourism revenue and GDP of the shock with the degree of response of each of them.

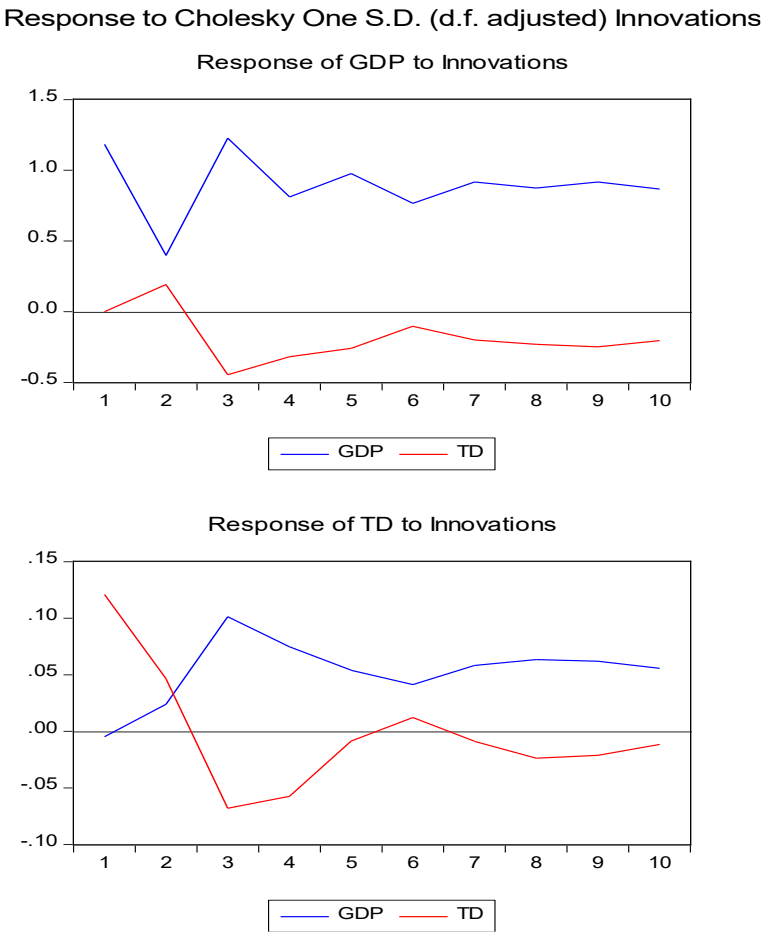


Fig. 4. Impulse response functions of GDP and tourism revenue

Source: own study based on the outputs of (Eviews10).

Through the previous two-axis curves, the vertical axis represents time, whilst the horizontal axis reflects the threshold of shocks. It can be argued that any shock in tourism revenue does not affect GDP presented by curve 01: the GDP response to the change in tourism revenue was not volatile throughout the study period, with confidence stabilising throughout the chain. In the second curve, one notes that tourism revenue was affected by the change in GDP, which saw a decline in the first three periods and stabilised over the next two periods, after which the (negative) rise continued. Thus it can be said that the response of the variables (GDP) has been achieved since the first period.

4.11. Variance Analysis

Variance analysis and segmentation is the measurement of the percentage of the interpreted variance of each internal variable compared to itself and to other variables, namely that the knowledge of the degree of influence between variables (the independent variable and its interpreted variables).

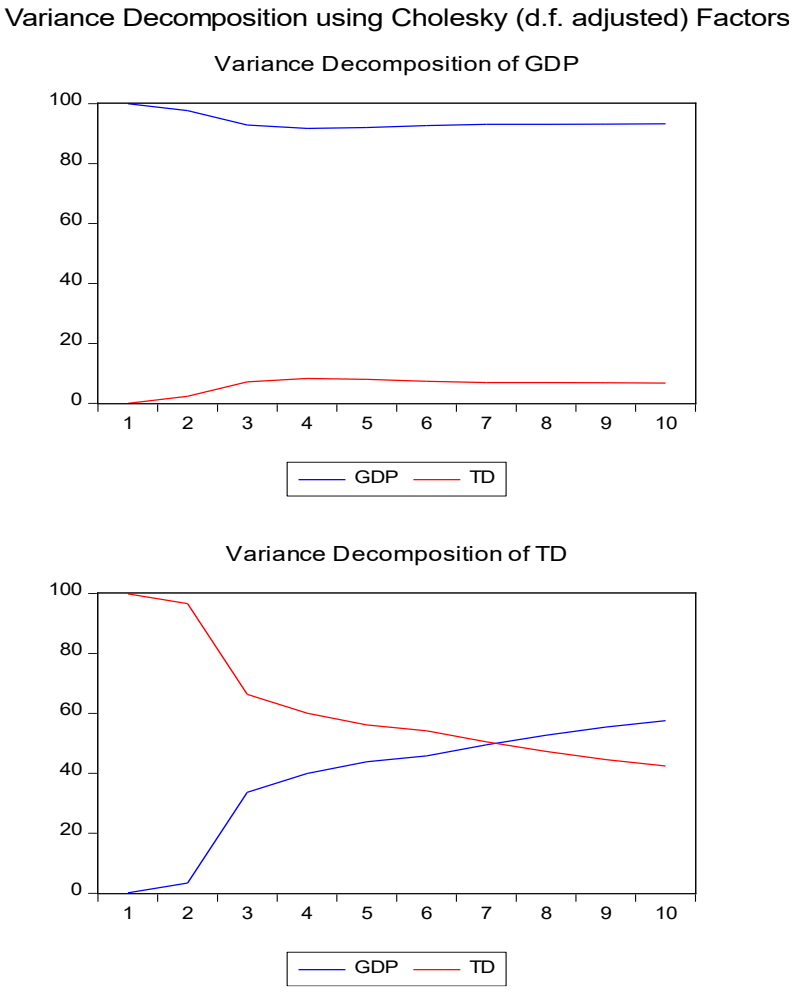


Fig. 5. Variance decomposition of GDP and tourism revenue

Source: own study based on the outputs of (Eviews10).

The curves present two axis, where the vertical axis represents time, whilst the horizontal axis represents the variable to be segmented. Based on the results of the variation analysis, it can be said that the shocks contributed effectively to the GDP variable by interpreting the variability in tourism revenue in the long term rather than in the short term, and that any sudden changes (shocks) in GDP would affect tourism revenues. Any shock in tourism revenue does not contribute to any change in the level of GDP in the long term, and any sudden changes (shocks) in tourism revenues do not affect GDP.

5. Discussion and Conclusions

Tourism is one of the world's largest and fastest growing industries, as it is a major source of global economic development. According to the United Nations World Tourism Organization, during recent decades the tourism sector has achieved high growth rates and increased its contribution to GDP. This paper examined a consolidated study of the impact of changes in tourism revenue on Algeria's economic growth rate during the period 2005-2023, especially with the challenges experienced by the Algerian economy also in connection with the pandemic crisis. The study used the ECM model, focusing on a range of variables, namely tourism revenue (TD) and output.

- Both GDP and TD series were complementary of the same degree and their degree of integration I(1), and based on the results of the test of the criteria for determining the delay periods of the model and according to the AIC and SC standards, it became clear that the optimal number of delays for the study variables was equal to 1.
- Based on the results of the Granger Causality tests, it was found that there was a one-way causal link between GDP and long-term tourism revenue, i.e. tourism revenue does not affect economic growth, especially in Algeria as an oil state dependent on petroleum revenue. At the same time, GDP affects tourism revenues because the latter supports all sectors and projects, including tourism. Following the joint integration test, it was found that there was a balance relationship, which allowed to estimate the ECM model.
- Through the self-correlation test of the remainder, it was found that there is no self-correlation between the errors (they were not self-correlated), hence there were no errors in the study model. When conducting the validity tests of the ECM model, it was found that the estimated model was not affected by heterogeneity or the problem of self-correlation, and met the conditions of stability.
- After testing the significance of parameters, it became clear that the CointEq error correction coefficient was negative (0.213708), and the pillar was important at 0.02992, explained by the long-term balance between studied variables of tourism revenue reflected by 21% of GDP changes; any imbalance at a single variable level would be corrected by this percentage in order to maintain long-term balance of the national economy, and relies primarily on the tourism sector. Tourism revenue cannot be absent from the gross domestic product (GDP) equation. When analysing shocks it was found that the response of the variable (GDP) was achieved from the first period.

By using the ECM/VECM framework and a set of econometric tests, this study provided several important insights.

5.1. Stationarity and Integration

The analysis showed that both GDP and tourism revenues are integrated of order one, I(1). This justified the use of co-integration techniques to capture the relationship between the two variables in both the short and long run.

5.2. Co-integration and Long-Term Relationship

The Johansson's co-integration test confirmed the existence of a long-term equilibrium relationship between GDP and tourism revenue. The error correction coefficient was negative and statistically significant (−0.213708, *Prob* = 0.02992), meaning that deviations from equilibrium were corrected over time. Approximately 21% of the imbalances were adjusted annually, highlighting a stable long-term link between the two variables.

5.3. Causality

The Granger causality tests revealed a one-way causal relationship progressing from GDP to tourism revenue, but not vice versa. This implies that in Algeria, economic growth stimulates tourism

development, whilst tourism revenue alone does not significantly drive economic growth. This outcome reflects the structural characteristics of Algeria's hydrocarbon-dependent economy, where tourism remains underdeveloped relative to its potential.

5.4. Short-Run Dynamics

The Wald test results confirmed the short-term significance of tourism revenue in the GDP equation, however its impact was modest, showing that tourism does not strongly influence short-term fluctuations in growth – instead, short-term economic expansion tends to support tourism activities rather than the reverse.

5.5. Shocks and Variance Decomposition Analysis

Impulse response functions indicated that shocks in tourism revenue had a negligible effect on GDP, whereas GDP shocks significantly influenced tourism revenue. Similarly, variance decomposition results showed that GDP reflected a large share of the variability in tourism revenue, whilst the tourism revenue reflected little of the variability in GDP. This finding reinforces the conclusion that tourism in Algeria is largely demand-driven by the broader performance of the economy.

5.6. Policy Implications

The results highlighted the importance of reforms and investment intended to transform tourism into a genuine growth driver. Key recommendations include:

- Diversifying the economy away from hydrocarbons to reduce dependency on oil revenue.
- Developing tourism infrastructure (transport, accommodation, cultural heritage management).
- Strengthening integration between tourism and other productive sectors such as agriculture, construction, and services.
- Reducing leakages in the parallel market and enhancing the formal contribution of tourism revenue to GDP.
- Promoting domestic and desert tourism, whilst also increasing international tourism competitiveness through marketing, governance, and quality improvements.

This study, based on the theoretical aspect of the relationship between the study variables, described a bilateral relationship between tourism revenue and the rates of economic growth, following the standardised modelling and via the obtained results achieved. It can be said that tourism does not contribute to increasing economic growth rates, particular in respect to tourism revenue and GDP, where this study confirmed the long-term balance in one direction between tourism revenue and GDP, and the results showed that any changes were abrupt. The shocks in GDP rates affected tourism revenue and economic growth, which justifies the one-way relationship between the two variables. For example, the pandemic crisis was a shock to the two variables – both the tourism revenues and the magnitude of economic growth – resulting in a significant decline in various fields and affecting the economy. According to the Tourism Organization of Algeria, the number of international tourists arriving globally decreased by 73% in 2020, a significant decline compared to 2019, jeopardizing between 100 million and 120 million direct tourist jobs. This resulted in heavy losses in international revenues for global economies, including Algeria, in particular due to the collapse in exports of tourism services (money spent by non-resident visitors in a country), and reduced exports of transport services (e.g. airline revenue from tickets sold to non-residents).

After standard modelling, the tourism sector contributed to the growth of Algeria's domestic product, as well as to the creation of many jobs, both directly and indirectly. Therefore, the government has made a considerable effort to develop this sector permanently in order to increase its competitiveness

and the ability to attract more tourists from all over the world. Algeria's tourism sector is important as an alternative to the oil sector and a renewable supplier of investment. Tourism has become an important resource of wealth if exploited well, and the quality and efficiency of tourism infrastructure and services have been improved, whilst the tourism awareness has been raised and considered an important benchmark in increasing the rate of economic growth.

5.7. Limitations and Directions for Future Research

This study, while providing important insights into the relationship between tourism revenue and economic growth in Algeria, has several limitations that should be acknowledged.

1. **Data limitations**: The analysis was restricted to the period 2005-2023, which may not fully capture long-term structural changes in Algeria's economy. Moreover, official tourism revenue data may not reflect informal tourism activities or leakages in the parallel market.
2. **Model specification**: The study relied primarily on the ECM/VECM approach, which captures linear and symmetric relationships. However, tourism–growth dynamics may exhibit non-linearities, feedback effects, and structural breaks (e.g. due to the COVID-19 pandemic or oil price shocks) that this framework cannot fully account for.
3. **Sectoral scope**: The research focused on aggregate GDP and total tourism revenue. It did not disaggregate tourism sub-sectors (domestic vs. international, desert vs. coastal tourism, cultural tourism, etc.) or explore regional differences within Algeria, which could have revealed important heterogeneity.
4. **Exclusion of complementary factors**: Other structural and institutional variables–such as infrastructure investment, governance quality, human capital, and political stability–were not explicitly modelled, even though they significantly shape the tourism–growth nexus.

5.8. Future Research Directions

Building on these limitations, future studies could:

- extend the time horizon and incorporate higher-frequency or panel data to capture more nuanced dynamics,
- employ advanced econometric techniques such as panel quantile regressions, nonlinear ARDL, or wavelet coherence analysis to uncover asymmetric and heterogeneous effects,
- explore sectoral and regional dimensions of tourism development in Algeria, including its impact on employment, poverty reduction, and spatial inequalities,
- integrate complementary variables (infrastructure, openness, institutional quality) to better explain the conditions under which tourism can contribute to sustainable growth,
- conduct comparative studies with other North African and resource-dependent economies to assess similarities and differences in the tourism–growth relationship.

References

Abu-Eid, Y. M. A. (2020). The Impact of Public Expenditures and Foreign Aid on Economic Growth in the West Bank and Gaza Strip for the Period 2008-2017. *Journal of Economics and Finance* [in Arabic], *6*(1), 48-59. https://doi.org/10.35394/1624-006-001-004

Alalawneh, M. M., Mammadov, J., & Alqasem, A. (2021). Nexus between FDI, Infrastructure Investment, Tourism Revenues, and Economic Growth: Mega Event Evidence. *Emerging Science Journal*, *5*(6), 953-963. https://doi.org/10.28991/esj-2021-01323

Al-Aishi, S. (2010). *Performance and Economic and Social Impact of Tourism in Algeria, Tunisia and Morocco*. Doctoral dissertation in economic sciences, 60ص. Batna: Hadj Lakhder University.

Alqaralleh, H., Alsarayreh, A., & Alsaraireh, A. (2025). The Asymmetric Relationship between Tourism and Economic Growth: A Panel Quantile ARDL Analysis. *Economies*, *13*(04), 1-21. https://doi.org/10.3390/economies13040097

Brida, J. G., Gómez, D. M., & Segarra, V. (2020). On the Empirical Relationship between Tourism and Economic Growth. *Tourism Management*, *81*, 104131. https://doi.org/10.1016/j.tourman.2020.104131

Brusentseva, J. A., Belousova, S. N., & Erpuleva, D. A. (2023). The Impact of Tourism on the Economic Development of Regions. *Proceedings of the Southwest State University Series Economics Sociology and Management*, *13*(5), 118-127. https://doi.org/10.21869/2223-1552-2023-13-5-118-127

Huseynli, B. (2024). The Effect of Tourism Revenues and Inflation on Economic Growth in Balkan Countries. *Ikonomicheski Izsledvania / Economic Studies Journal*, *33*(1), 150-165.

Huseynli, N. (2022). Econometric Analysis of the Relationship between Tourism Revenues, Inflation and Economic Growth: The Case of Morocco and South Africa. *African Journal of Hospitality Tourism and Leisure*, *11*(1), 135-146. https://doi.org/10.46222/ajhtl.19770720.216

Hussain, A., & Nawaz, M. A. (2024). Economic Growth Through Tourism: A Global Analysis Using CS-ARDL Approach. *IRASD Journal of Economics*, *6*(2), 513-528. https://doi.org/10.52131/joe.2024.0602.0221

İmamoğlu, H., Günay, T., & Çağlar, D. (2022). Testing the Moderating Effect of Tourism Revenue and Globalization on the Economic Growth: Empirical Evidence from Mediterranean Countries. *Journal of Tourism and Gastronomy Studies*, *10*(1), 52-61. https://doi.org/10.21325/jotags.2022.977

Morsi, M. (2001). Tourism Development, Its Concept, Determinants and Importance, with Reference to the Case of Egypt. Foreign Memoirs Series. National Planning Institute, Cairo.

Nayaradou, M. (2004). *L'impact de la régulation de la publicité sur la croissance économique*. Doctoral dissertation, Université Paris Dauphine-PSL.

Nissan, E., Galindo, M.-A., & Méndez, M. T. (2010). Relationship between Tourism and Economic Growth. *The Service Industries Journal*, *31*(10), 1567-1572.

Pigliaru, F., Brau, R., & Lanza, A. (2007). How Fast Are Small Tourist Countries Growing? The 1980-2003 Evidence. *Nota di Lavoro*, (1).

Prestiantika, S., & Sishadiyati, S. (2024). The Effect of Tourism Revenue on Community Welfare through Economic Growth. *Nomico Journal*, *1*(4), 72-79. https://doi.org/10.62872/h7tzxj20

Rashi, B. Z. (2016). Tourism and Economic Growth in Algeria: Evidence from Cointegration and Causality Analysis. *MPRA Paper*, (78731). Retrieved October 13, 2024, from https://mpra.ub.uni-muenchen.de/78731/

Rasool, H., Maqbool, S., & Tarique, M. (2021). The Relationship between Tourism and Economic Growth among BRICS Countries: A Panel Cointegration Analysis. *Future Business Journal*, *7*(1), 2-11. https://doi.org/10.1186/s43093-020-00048-3

Roy, M. & Medhekar, A. (2025). Tourism-Led Growth Hypothesis: A Global Perspective Bibliographic Analysis. *Asia Pacific Journal of Tourism Research*, 1-32. https://doi.org/10.1080/10941665.2025.2523354

Shaqaqil, I. (2020). The Impact of Tourism Revenues on Economic Growth in Some Countries in the Middle East and North Africa Using Cross-Sectional Sample Data during the Period 1995-2017. *Revue des Réformes Economiques et Intégration En Economie Mondiale*, *4*(1).

Sow, A. (2013). La contribution de l'éducation à la croissance économique du Sénégal. Economies et finances [The Contribution of Education to the Economic Growth of Senegal]. Université de Bourgogne; Université Gaston Berger. PhD thesis. Retrieved September 20, 2024, from https://tel.archives-ouvertes.fr/tel-00880199/file/13061.pdf

The World Tourism Organization. (2025). *World Tourism Barometer: January 2025*.

The World Travel & Tourism Council [WTTC]. (2024). *Travel & Tourism Economic Impact 2024*.

Wang, D., Liu, A. T. & Cheung, C. (2023). Understanding Memorable Tourism Experience: Long-Term Memory System and Revisit Intention. *European Journal of Tourism, Hospitality and Recreation*, *13*(2), 125-141. https://doi.org/10.2478/ejthr-2023-0011

Wijesekara, C., Tittagalla, C., Jayathilaka, A., Ilukpotha, U., Jayathilaka, R., & Jayasinghe, P. (2022). Tourism and Economic Growth: A Global Study on Granger Causality and Wavelet Coherence. *PLoS ONE*, *17*(09), 1-21.

World Bank Group. (n.d.). *World Bank Open Data*. Retrieved November 26, 2025, from https://data.worldbank.org/

Zerkak, S. & Souman, M. O. (2024). Empirical Estimation of the Potential Economic Impact of Tourism Promotion Policy in Algeria. *International Journal of Professional Business Review*, *9*(10). https://doi.org/10.26668/businessreview/2024.v9i10.4993

Pomiar wpływu przychodów z turystyki na wzrost gospodarczy w Algierii w latach 2005-2023 z wykorzystaniem modelu korekcji błędów ECM

Streszczenie

Cel: Celem niniejszego badania było zmierzenie wpływu przychodów z turystyki na wzrost gospodarczy Algierii w latach 2005-2023.

Metodyka: Autorzy wykorzystali model korygowania błędów zarządzania treścią przedsiębiorstwa, aby przetestować długoterminowy związek przyczynowo-skutkowy między przychodami z turystyki a wzrostem gospodarczym oraz wspólną integrację.

Wyniki: Po przetestowaniu stabilności łańcuchów czasowych zmienne badawcze okazały się niezawodne w najwyższym stopniu. Wyniki oszacowań wykazały związek przyczynowo-skutkowy między tymi dwiema zmiennymi w krótkim okresie. Po przetestowaniu istotności parametrów współczynnik korekcji błędu CointEq okazał się ujemny i etyczny. Wyjaśnia to długoterminową równowagę między zmiennymi badanego wpływu zarówno na PKB, jak i na zmianę przychodów z turystyki.

Implikacje i rekomendacje: Rekomenduje się: promowanie kultury turystycznej społeczności, rozwijanie infrastruktury turystycznej oraz nawiązywanie współpracy z sektorem prywatnym i uruchamianie projektów turystycznych.

Oryginalność/wartość: Zagadnienie opisane w artykule jest szczególnie istotne w kontekście wzrostu zainteresowania sektorem turystyki jako sposobu finansowania gospodarki, postrzeganym jako alternatywa dla bogactwa pochodzącego z ropy naftowej.

Słowa kluczowe: turystyka, przychody z turystyki, wzrost gospodarczy, związek przyczynowo-skutkowy, model korekcji błędów