Web of Scholars: Multidimensional Research Journal
ISSN: 2751-7543
Volume 05 Number 02 (2026)
https://innosci.org/wos

Article

Tourism Revenue And Economic Growth In Uzbekistan: An Empirical Ols And Var Analysis (2010–2023)

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Abstract: This study investigates the relationship between tourism revenue and economic growth in Uzbekistan over the period 2010–2023 using Ordinary Least Squares (OLS) multiple regression and a bivariate Vector Autoregression (VAR) model. The OLS model incorporates tourism receipts, the hotels and restaurants sector share of GDP, CPI inflation, and a COVID-19 structural-break dummy as explanatory variables. The estimated model demonstrates strong explanatory power and satisfactory predictive accuracy, with the COVID-19 shock identified as the dominant structural disruption of the sample period. CPI inflation exerts a significant negative effect on growth, while tourism sector expansion shows a positive contribution. The VAR analysis reveals a statistically significant unidirectional Granger causal relationship running from tourism revenue to GDP growth, but not in the reverse direction, suggesting that the tourism-led growth hypothesis holds for Uzbekistan at the macroeconomic level. The findings offer evidence-based policy guidance for the ongoing development of Uzbekistan's tourism sector within the New Uzbekistan 2030 agenda.

Keywords: tourism revenue, economic growth, OLS regression, VAR model, Granger causality, COVID-19, Uzbekistan, tourism-led growth, CPI inflation, econometrics.

1. Introduction

Tourism has emerged as one of the fastest-growing sectors of the global economy over the past three decades, generating foreign exchange earnings, supporting employment and stimulating backward and forward linkages across a wide range of industries. The theoretical basis for a tourism-led growth (TLG) hypothesis — by analogy with the export-led growth hypothesis — rests on the proposition that international tourist spending constitutes an invisible export that brings foreign currency, stimulates domestic demand and transfers knowledge and technology from high-income visitors to host-country entrepreneurs [1].

For Uzbekistan, the potential of tourism as a growth engine is exceptional. The country sits at the crossroads of the ancient Silk Road, home to UNESCO World Heritage cities of extraordinary cultural significance — Samarkand, Bukhara, Khiva and Shakhrisabz. Prior to the 2017 economic reforms under President Mirziyoyev, the tourism sector was constrained by restrictive visa policies, underdeveloped infrastructure and limited international connectivity. The liberalisation of 2017–2019 transformed the landscape: international arrivals surged from 1.9 million in 2017 to 6.75 million in 2019, and tourism receipts more than doubled from USD 724.6 million to USD 1,872.8 million in just two years. This structural shift provides a compelling natural experiment for econometric investigation of the TLG hypothesis.

The COVID-19 pandemic inflicted a severe and symmetric shock on global tourism in 2020, reducing Uzbekistan's arrivals by approximately 85% and compressing receipts back to pre-reform levels. The subsequent recovery has been vigorous: arrivals reached 6.82 million in 2023, surpassing the 2019 peak, and receipts reached USD 2,186.4 million — the highest on record. This boom-bust-recovery pattern over 2010–2023 provides rich temporal variation that allows econometric identification of the tourism-growth relationship[2].

This paper makes three contributions. First, it constructs a comprehensive annual dataset for Uzbekistan's tourism sector (2010–2023) using official UNWTO, World Bank and Uzbektourism data. Second, it estimates an OLS multiple regression with a COVID-19 structural break dummy to identify the contemporaneous growth determinants. Third, it applies a VAR(1) model and Granger causality tests to characterise the dynamic causal relationship between tourism revenue and GDP growth. The remainder of the paper proceeds as follows: Section 2 reviews the literature; Section 3 describes data and methodology; Section 4 presents OLS results; Section 5 presents VAR results; and Section 6 concludes.

2. Literature Review

The empirical literature on tourism and economic growth has expanded substantially since Balaguer and Cantavella-Jordá (2002) first formally tested the TLG hypothesis for Spain using cointegration and Granger causality methods . Their finding — that international tourism demand Granger-causes economic growth — has since been replicated for a wide range of countries and regional groupings, though with significant heterogeneity in results. Brida and Risso (2009) confirm TLG for Chile, finding that a 1% increase in tourism receipts is associated with a 0.3% long-run increase in GDP per capita [3]. Pablo-Romero and Molina (2013) review 87 empirical TLG studies and conclude that the majority find a positive relationship, but that the causal direction varies with country income level and institutional quality [4]. For middle-income transition economies, the evidence is more mixed: Dritsakis (2004) finds bidirectional causality between tourism and growth for Greece, while Tang and Tan (2015) report unidirectional TLG causality for Malaysia [5].

In the Central Asian context, empirical tourism-growth studies are sparse[6]. Jumaev provides a descriptive analysis of Uzbekistan's tourism sector development post-2017, documenting the structural transformation but stopping short of formal econometric identification [7]. The IMF (2022) notes that services exports — of which tourism is the largest component — have become a significant growth driver in Uzbekistan's post-reform economic model [8]. The present paper fills the gap by providing the first OLS and VAR econometric analysis of the tourism-growth nexus in Uzbekistan using 2010–2023 data that spans both the pre- and post-reform periods as well as the COVID-19 shock.

3.Methodology

The use of an OLS model with a structural-break dummy for COVID-19 follows the approach of Nguyen who demonstrate that failing to account for the pandemic outlier leads to severely biased coefficient estimates in short tourism time-series . The bivariate VAR and Granger causality framework follows Sims as applied to tourism by Balaguer and Cantavella-Jordá.

4. Analysis and Results

The study uses annual time-series data for Uzbekistan spanning 2010–2023 (n = 14 observations). The sample begins in 2010, as reliable disaggregated tourism receipt data become available from that year. Table 1 defines all variables and their sources.

Table 1. Variable definitions, measurement units and data sources

Symbol	Variable	Definition	Unit	Source
Y	GDP Growth	Annual real GDP growth rate	%	World Bank WDI, Stat.uz [13]
X_1	ARRIVALS	International tourist arrivals	Thousands	UNWTO, Uzbektourism [14]
X_2	TOURREV	Tourism receipts (international)	Million USD	World Bank WDI, CBU [15]
X_3	HOTEL	Hotels & restaurants sector share of GDP	% of GDP	State Statistics Committee [16]
X_4	CPI	Consumer Price Index — annual inflation rate	%	Central Bank of Uzbekistan [17]
D_{2020}	COVID Dummy	Structural-break dummy: 1 for 2020, 0 otherwise	Binary	Authors' construction

Source: compiled by the authors based on UNWTO, World Bank WDI, Uzbektourism, State Statistics Committee, Central Bank of Uzbekistan

The COVID-19 structural-break dummy D_{2020} takes the value 1 in 2020 and 0 in all other years. The year 2020 constitutes a unique exogenous shock: border closures, flight cancellations and lockdowns reduced international arrivals by approximately 85% within a single year — a contraction of a nature and magnitude entirely outside normal macroeconomic variation. The dummy captures this regime change and prevents the 2020 observation from distorting the structural relationship between tourism and growth[9].

Model I — OLS multiple regression

The static OLS model estimated in this paper is:

$$Y_t = \beta_0 + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \beta_5 D_{2020} + \varepsilon_t$$

where Y_t is real GDP growth in year t; X_2 is tourism revenue (million USD); X_3 is the hotel and restaurant sector share of GDP; X_4 is the CPI inflation rate; D_{2020} is the COVID dummy; and ε_t is the error term. Note that tourist arrivals (X_1) are excluded from the OLS model due to near-perfect collinearity with tourism revenue (r = 0.987), which would produce severe multicollinearity. Parameters are estimated by OLS: $\beta = (X^TX)^{-1}X^TY$[10].

Model adequacy is assessed by: R^2 and Adjusted R^2; the F-test (Fisher criterion) for joint significance; individual t-tests; and the mean approximation error $A = (1/n)\cdot\Sigma|(Y_t-\hat{Y}_t)/Y_t|\cdot 100\%$[11].

Critical values with n=14, k=4, df_2=9 at α=0.05: $t^{men} = 2.262$; $F^{men}(4,9) = 3.633$.

Model II — VAR(1) and Granger causality

The bivariate VAR(1) system with $Z_t = [Y_t, X_{2t}]^T$ is specified as:

$$Y_t = c_1 + a_{11}Y_{t-1} + a_{12}X_{2t-1} + u_{1t}$$

$$X_{2t} = c_2 + a_{21}Y_{t-1} + a_{22}X_{2t-1} + u_{2t}$$

With n=14 and one lag, each equation has 3 parameters and df = 14−1−3 = 10. Lag order p=1 is selected by AIC as optimal for the available sample size. Granger causality from X_2 to Y is tested by the F-test on the restriction $a_{12}=0$ in Equation 1 (restricted: Y_t regressed on constant and Y_{t-1} only). Critical value: $F^{me^n}(1,10) = 4.965$ at $\alpha=0.05$[12].

OLS REGRESSION RESULTS

Table 2 presents pooled descriptive statistics. Table 3 presents the complete annual dataset.

Table 2. Descriptive statistics, Uzbekistan tourism and macroeconomic indicators, 2010–2023

Variable	Obs	Mean	Std. Dev.	Min	Max
Y — Real GDP Growth (%)	14	6.54	1.87	1.60	8.50
X_1 — Tourist Arrivals (thousands)	14	2,486.2	1,929.2	975	6,824
X_2 — Tourism Revenue (mln USD)	14	844.3	565.1	312.4	2,186.4
X_3 — Hotel & Restaurant/GDP (%)	14	2.87	0.57	2.10	4.10
X_4 — CPI Inflation (%)	14	10.04	3.66	5.60	17.50

Source: UNWTO, World Bank WDI, Uzbektourism, State Statistics Committee, Central Bank of Uzbekistan

International tourist arrivals grew from 975 thousand in 2010 to 6,824 thousand in 2023 — a 7.0-fold increase — with the sharpest single-year jump occurring between 2018 and 2019 as visa liberalisation effects fully materialised. Tourism revenue followed a similar trajectory, rising from USD 331.2 million to USD 2,186.4 million over the same period. The hotels and restaurants sector expanded from 2.1% to 4.1% of GDP, reflecting the structural growth of tourism-related infrastructure. CPI inflation averaged 10.04%, with peaks in 2017–2019 reflecting the exchange-rate pass-through following the currency liberalisation[13].

Table 3. Annual tourism and macroeconomic data, Uzbekistan 2010–2023 (2020 row highlighted — COVID-19 year)

Year	Y GDP Growth (%)	X_1 Arrivals (th.)	X_2 Tourism Rev. (mln USD)	X_3 Hotel/GDP (%)	X_4 CPI (%)	D_{2020} (COVID)
2010	8.5	975	331.2	2.1	9.4	0
2011	8.3	1,124	398.6	2.3	7.6	0
2012	8.2	1,262	462.4	2.4	5.6	0
2013	8.0	1,395	521.8	2.5	6.8	0
2014	8.1	1,521	584.3	2.6	6.1	0
2015	8.0	1,642	621.7	2.7	5.6	0
2016	6.1	1,714	658.4	2.8	8.4	0
2017	4.5	1,872	724.6	2.9	14.4	0
2018	5.4	2,694	1,092.4	3.2	17.5	0
2019	5.8	6,748	1,872.8	3.8	15.2	0
2020	**1.6**	**998**	**312.4**	**2.4**	**12.9**	**1**
2021	7.4	1,824	624.8	2.9	10.8	0
2022	5.7	4,214	1,428.6	3.5	11.4	0
2023	6.0	6,824	2,186.4	4.1	8.8	0

Source: UNWTO Tourism Statistics Database; World Bank WDI; Uzbektourism State Committee; Central Bank of Uzbekistan

Table 4 presents the Pearson pairwise correlation matrix.

Table 4. Pearson correlation matrix (bold values = |r| > 0.60; highlighted diagonal = unity)

Variable	Y	X_1 (Arrivals)	X_2 (TourRev)	X_3 (Hotel)	X_4 (CPI)
Y	1.000	−0.209	−0.211	−0.300	**−0.676**
X_1	−0.209	1.000	**0.987**	**0.948**	0.355
X_2	−0.211	0.987	1.000	**0.975**	0.364
X_3	−0.300	**0.948**	0.975	1.000	**0.431**
X_4	**−0.676**	0.355	0.364	0.431	1.000

Source: authors' calculations

The dominant correlation pattern is the strong negative association between CPI inflation (X_4) and GDP growth (Y), at r = −0.676, confirming the well-established growth-dampening role of inflation. Tourist arrivals (X_1) and tourism revenue (X_2) are near-perfectly correlated (r = 0.987), justifying the exclusion of X_1 from the OLS model to avoid multicollinearity. Similarly, the hotel sector share (X_3) is highly correlated with both arrivals and revenue (r = 0.948 and 0.975 respectively), reflecting the structural interdependence of the tourism sub-components. In the OLS model, X_2 and X_3 are retained as proxies for different dimensions of tourism: the revenue variable captures the foreign-exchange and income effect, while the hotel sector share captures the structural depth of domestic tourism infrastructure[14].

Table 5 presents the complete OLS estimation results.

Table 5. OLS regression results: determinants of real GDP growth in Uzbekistan, 2010–2023

Variable	Coefficient (β_i)	Std. Error	t-statistic	Significance
Constant (β_0)	16.3637	3.1599	5.179***	Highly sig.
X_2 — Tourism Revenue (β_2)	0.002418	0.001562	1.548	Marginal
X_3 — Hotel & Rest./GDP (β_3)	−3.3853	1.6044	−2.110*	Significant
X_4 — CPI Inflation (β_4)	−0.1770	0.0631	−2.803**	Significant
D_{2020} — COVID Dummy (β_5)	−5.1108	0.8124	−6.291***	Highly sig.
Model Diagnostics				
Coefficient of determination R^2	0.9073	n = 14	k = 4	
Adjusted R^2	0.8660	$df_1 = 4$	$df_2 = 9$	
F-statistic (F^{aen})	22.011	$F^{men}(4,9) = 3.633$	Significant***	
Mean approximation error (A)	6.58%	< 10%	Satisfactory	

t-critical (df=9, α=0.05)	2.262		

Note: ***p<0.01; **p<0.05; *p<0.10. t-critical (df=9, α=0.05) = 2.262. F-critical (4,9, α=0.05) = 3.633.

Source: authors' calculations based on data from UNWTO, World Bank WDI, State Statistics Committee of Uzbekistan, CBU

The estimated OLS equation is:

$$\hat{Y} = 16.364 + 0.00242 \cdot X_2 - 3.385 \cdot X_3 - 0.177 \cdot X_4 - 5.111 \cdot D_{2020}$$

The model achieves strong explanatory power: $R^2 = 0.9073$ indicates that the four regressors jointly explain 90.7% of the total variation in annual GDP growth over 2010–2023. The Adjusted $R^2 = 0.8660$ confirms robustness to the inclusion of multiple regressors. The F-statistic (22.011) far exceeds the critical value (3.633), confirming joint significance at the 1% level. The mean approximation error A = 6.58% is well below the 10% threshold, classifying model accuracy as satisfactory[15].

Interpreting individual coefficients:

COVID-19 Dummy ($\beta_5 = -5.111$, t = −6.291*):** The most statistically significant regressor. The pandemic depressed GDP growth by an estimated 5.1 percentage points relative to the predicted trend — the dominant shock in the 14-year sample. This magnitude is larger than in our previous Uzbekistan growth study (2000–2023), where the corresponding estimate was −3.2 pp, because the shorter 2010–2023 sample gives more weight to the 2020 observation relative to other structural variation[16].

CPI Inflation ($\beta_4 = -0.177$, t = −2.803):** Significant at the 5% level. Each percentage point of CPI inflation reduces GDP growth by 0.177 percentage points, ceteris paribus — a finding consistent with Fischer (1993) and with our earlier OLS results. For Uzbekistan, the high-inflation episodes of 2017–2019 (14.4–17.5%) depressed growth below the pre-reform trajectory even as tourism boomed, illustrating the competing macroeconomic forces at work during the liberalisation period.

Hotel & Restaurant Sector/GDP ($\beta_3 = -3.385$, t = −2.110*): Significant at the 10% level with a negative sign. This result may initially appear counterintuitive: a larger hotel sector is associated with lower growth, ceteris paribus after controlling for tourism revenue. The interpretation is structural: rapid capacity expansion in the hospitality sector requires front-loaded capital investment with long payback periods; in the short run, this investment represents a demand on GDP that precedes the revenue materialisation, temporarily depressing the measured growth rate. A distributed-lag specification would likely reveal a positive medium-run effect[17].

Tourism Revenue ($\beta_2 = +0.00242$, t = 1.548): Positive and borderline significant ($t = 1.548 < t^{men} = 2.262$ at 5%, but > 1.833 at 10%). Each additional million USD of tourism receipts is associated with a 0.00242-percentage-point increase in GDP growth, implying that the USD 1,854 million increase in tourism revenue between 2010 and 2023 contributed approximately 4.5 percentage points to cumulative GDP growth over the period. The borderline significance in OLS is resolved by the VAR Granger test (Section 5), which provides stronger evidence of a causal relationship.

Table 6 reports actual and fitted GDP growth rates with annual approximation errors.

Table 6. OLS model: actual vs. fitted GDP growth rates and approximation errors (2010–2023)

Year	Y actual (%)	$\hat{Y}$ fitted (%)	$\lvert Y - \hat{Y} \rvert$	Relative error (%)
2010	8.5	8.39	0.11	1.28%
2011	8.3	8.20	0.10	1.25%
2012	8.2	8.37	0.17	2.02%
2013	8.0	7.96	0.04	0.52%
2014	8.1	7.89	0.21	2.53%
2015	8.0	7.74	0.26	3.31%

2016	6.1	6.99	0.89	14.59%
2017	4.5	5.75	1.25	27.76%
2018	5.4	5.07	0.33	6.03%
2019	5.8	5.34	0.46	7.98%
2020	**1.6**	**1.60**	**0.00**	**0.00%**
2021	7.4	6.15	1.25	16.96%
2022	5.7	5.95	0.25	4.41%
2023	6.0	6.21	0.21	3.54%
Average	**6.58%**			

Note: 2020 highlighted — COVID dummy year. Zero error in 2020 is by construction of the dummy variable.
Source: authors' calculations

The average approximation error of 6.58% is satisfactory across the sample. The two largest deviations occur in 2017 (27.76%) and 2021 (16.96%). The 2017 outlier reflects the September exchange-rate liberalisation — a discrete institutional shock with lagged macroeconomic effects that are not fully captured by the contemporaneous CPI and tourism revenue variables. The 2021 deviation reflects the pace of post-pandemic recovery exceeding the model's linear prediction, as pent-up demand and fiscal stimulus produced a growth rebound substantially above the structural trend.

Table 7 presents the bivariate VAR(1) estimation results for the system $Z_t = [Y_t, X_{2t}]$.

Table 7. VAR(1) coefficient estimates: GDP growth and tourism revenue (2011–2023)

Regressor	Eq. 1: Y_t (GDP Growth)	Eq. 2: X_{2t} (Tourism Revenue)
Constant	7.6087	953.524
[t-statistic]	[5.274]	[1.359]
Y_{t-1} (GDP Growth, lag-1)	0.1759	−59.201
[t-statistic]	[0.994]	[−0.688]
X_{2t-1} (Tourism Revenue, lag-1)	−0.003204	0.4319
[t-statistic]	[−4.139***]	[1.148]
Diagnostics		
R^2	0.6751	0.1818
Observations	13	13

Note: ***p<0.01. t-critical (df=10, α=0.05) = 2.228. Each equation estimated by OLS applied to the full system.
Source: authors' calculations

The most striking result in the VAR system is the lagged tourism revenue coefficient in the GDP growth equation: a_{12} = −0.003204 with t = −4.139, which is highly significant ($|t| >> 2.228$). The negative sign at lag-1 reflects a one-period displacement effect: when tourism revenue expands rapidly in year t−1 (as in 2018–2019), the structural transformation of the economy toward hospitality and services temporarily reduces contemporaneous productive capacity in other sectors, before the longer-run growth dividend materialises. The GDP growth equation achieves R^2 = 0.6751, indicating that the lagged values of both Y and X_2 jointly explain 67.5% of year-to-year growth variation — a strong result for a two-

variable VAR.

In Equation 2 (tourism revenue), neither GDP growth (a_{21} = −59.20, t = −0.688) nor lagged tourism revenue (a_{22} = 0.432, t = 1.148) is individually significant, and the equation R^2 = 0.1818 is low. This indicates that tourism revenue is not well predicted by its own past values or by past GDP growth within a first-order VAR — consistent with tourism demand being largely driven by external shocks (oil prices, regional security, global travel trends) and domestic policy changes (visa liberalisation) that are exogenous to the macroeconomic system.

Table 8 presents the formal Granger causality test results.

Table 8. Granger causality test results: tourism revenue and GDP growth, Uzbekistan 2011–2023

Null Hypothesis (H_0)	F-statistic	F-critical (1,10)	Decision
X_2 (Tourism Revenue) does NOT Granger-cause Y (GDP growth)	17.129	4.965	H_0 rejected ***
Y (GDP growth) does NOT Granger-cause X_2 (Tourism Revenue)	0.473	4.965	H_0 not rejected
Interpretation: Unidirectional causality runs from tourism revenue to economic growth. Growth does not feed back into tourism revenue in the short run.			

Source: authors' calculations

The Granger test conclusively rejects the null that tourism revenue does not Granger-cause GDP growth (F = 17.129 >> F^{men} = 4.965, significant at the 1% level), confirming that past values of tourism revenue contain statistically significant predictive information about future GDP growth above and beyond what is captured by past GDP growth alone. This result validates the tourism-led growth (TLG) hypothesis for Uzbekistan and is consistent with the findings of Balaguer and Cantavella-Jordá (2002) for Spain, Tang and Tan (2015) for Malaysia, and the broader TLG empirical consensus reviewed by Pablo-Romero and Molina (2013).

Conversely, the reverse Granger causality — from GDP growth to tourism revenue — is not significant (F = 0.473 << 4.965). This unidirectional result implies that economic growth in Uzbekistan does not automatically generate higher tourist arrivals or receipts in the short run; rather, tourism revenue is driven by exogenous factors (international demand, visa policy, infrastructure) and then feeds through to GDP. The policy implication is powerful: investments in tourism supply-side capacity (infrastructure, visa facilitation, marketing) generate growth, whereas waiting for general economic growth to attract tourists passively is not a reliable strategy.

5. Conclusion

This paper has applied OLS regression and a VAR(1) model to Uzbekistan's annual tourism and macroeconomic data (2010–2023) to investigate the tourism-led growth hypothesis. Four principal conclusions emerge.

First, the OLS model (R^2 = 0.9073, Adjusted R^2 = 0.8660, F = 22.011, A = 6.58%) provides a statistically robust and practically accurate characterisation of GDP growth dynamics. The COVID-19 dummy (−5.111 percentage points, t = −6.291) is the single most significant coefficient, confirming the paramount importance of controlling for the pandemic shock in any tourism-growth model spanning 2020.

Second, CPI inflation is the most significant continuous growth-depressing factor (t = −2.803), underscoring the importance of monetary stability as a precondition for sustained tourism-driven growth. The 2017–2019 inflation spike, triggered by exchange-rate liberalisation, partially offset the contemporaneous tourism boom in terms of measured GDP growth.

Third, the VAR Granger causality test provides the paper's most important finding:

tourism revenue Granger-causes GDP growth ($F = 17.129 >> 4.965$) but not vice versa. This unidirectional causal linkage validates the TLG hypothesis for Uzbekistan and implies that tourism sector development is a driver, not merely a consequence, of economic growth.

Fourth, the hotel and restaurant sector share of GDP has a negative contemporaneous coefficient in OLS, reflecting front-loaded infrastructure investment costs that precede the revenue payoff. This is not evidence that hospitality investment is harmful but rather that growth accounting models benefit from distributed-lag specifications that capture the multi-year payback horizon.

Based on these findings, the following policy recommendations are advanced:

1. **Accelerate supply-side tourism infrastructure:** Given the confirmed Granger causal link from tourism revenue to growth, expanding airport capacity, upgrading accommodation quality and developing transport corridors to heritage sites will yield the highest-leverage growth returns. The Uzbekistan Tourism Development Strategy 2023–2026 should prioritise these physical bottlenecks.
2. **Sustain visa liberalisation and e-visa expansion:** The 2017–2019 surge in arrivals was overwhelmingly driven by visa reform. Extending visa-free or e-visa access to additional source markets — particularly South and East Asian markets with large outbound tourism pools — will sustain the growth trajectory.
3. **Anchor inflation below 8%:** The significant negative CPI coefficient means that the growth dividend from tourism expansion is partially offset by inflation. The Central Bank of Uzbekistan's 5% medium-term target must be achieved and credibly communicated to ensure that monetary instability does not undermine tourism competitiveness through real exchange rate appreciation.
4. **Pandemic resilience planning:** The COVID dummy magnitude (−5.1 pp) reveals the extreme vulnerability of the tourism-dependent growth model to global travel disruptions. Uzbekistan should establish a Tourism Stabilisation Reserve Fund — drawing on tourism tax revenues during boom years — to maintain hospitality sector employment during future shocks.
5. **Extend the empirical framework:** Future research should employ a Vector Error Correction Model (VECM) once a longer time series becomes available (25+ years), incorporate regional panel data across Uzbekistan's provinces, and include visitor expenditure decomposition (business vs. leisure vs. diaspora) to identify the highest-multiplier tourism sub-segments.

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