

Extensive Growth at Its Limits: Panel Evidence on the Determinants of Regional Tourism Employment in Uzbekistan

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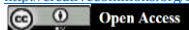
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ABSTRACT

Uzbekistan has expanded its tourism supply very rapidly: accommodation capacity grew 5.8-fold between 2016 and 2025. This study asks whether further physical expansion still pays off in regional tourism employment, and which destination attributes are associated with it.

A balanced panel of 14 regions observed over 2018–2024 ($N = 98$) is used to estimate a log-linear Cobb–Douglas function of tourism employment on accommodation capacity, tangible cultural heritage, domestic travel activity, recreational infrastructure and population. Pooled, between, fixed-effects and random-effects estimators are compared, with cluster-robust and Driscoll–Kraay standard errors, a variance decomposition and dynamic-panel checks.

Across regions, accommodation capacity is the strongest correlate of tourism employment: its elasticity is 0.546 in the pooled model and 0.606 in the between model (both $p < 0.01$). Within regions over time the capacity elasticity falls to 0.026 and is significant only at the 10% level with Driscoll–Kraay errors, whereas domestic travel activity is positive and significant (0.069 and 0.077, $p < 0.05$). The sum of elasticities in the pooled model (0.901) indicates decreasing returns to scale. Dynamic estimators are uninformative with seven periods, so the coefficients are interpreted as associations rather than causal effects.

The paper provides the first region-level panel evidence for Uzbekistan that separates long-run cross-regional differences from short-run within-region change. It shows that the extensive, capacity-led growth model is approaching its limit and that utilisation of existing capacity and domestic demand deserve priority.

Introduction

International tourism has returned to growth after the pandemic. UN Tourism (2026) reports 1.52 billion international arrivals in 2025, 4% more than in 2024. As the recovery phase ends, competition between destinations depends less on visitor numbers and more on how efficiently resources, services and institutions turn visits into income and jobs (World Economic Forum, 2024; Dwyer & Kim, 2003).

Uzbekistan is one of the fastest-growing destinations in this period. Foreign arrivals rose from 2.03 million in 2016 to 11.68 million in 2025, and exports of tourism services reached USD 4.83 billion in 2025. Supply grew even faster: the number of bed-places in hotels and similar establishments increased from 31,950 to 185,613, a 5.81-fold rise. Growth has nevertheless been uneven. Receipts per foreign visitor rose from USD 194.6 in 2019 to USD 413.3 in 2025, but 67.3% of 2025 arrivals were visits to friends and relatives. Four destinations — Tashkent city, Samarkand, Bukhara and Khorezm — account for 62.5% of foreign visits (Tourism Committee of the Republic of Uzbekistan, 2026; National Statistics Committee of the Republic of Uzbekistan, 2026). Policy targets for 2030 — 20 million foreign visitors and USD 6 billion in exports — raise a practical question: will further expansion of physical capacity keep producing proportional gains in regional tourism activity?

The tourism-led growth literature links tourism expansion to income and employment, but its evidence is mostly national and mixed (Sinclair, 1998; Brida et al., 2016). Studies of tourism employment show that the employment response depends on the stage of development and can be non-linear (Vuković et al., 2023). At the regional level, panel studies for European regions find that tourism contributes to regional growth, but its effect depends on local assets and on spillovers between neighbouring regions (Soukiazis & Proença, 2008; Paci & Marrocu, 2014; Yang & Fik, 2014). Destination competitiveness models stress that core resources such as heritage only create value when they are combined with supporting infrastructure, demand and management (Ritchie & Crouch, 2003; Dwyer & Kim, 2003; Assaf & Josiassen, 2012).

Research on Uzbekistan has examined the macroeconomic links between tourism, growth and emissions (Qodirov et al., 2024), sustainability challenges along the Silk Road (Karimov et al., 2025) and the competitiveness and life-cycle stages of key destinations (Nodirbek, 2025). What is missing is region-level evidence on which destination attributes are associated with tourism employment, and on whether these associations reflect permanent differences between regions or short-run change within them. This distinction matters for policy. If capacity explains differences between regions but not changes within them, building more hotels in a given region will not, by itself, create proportional employment.

This paper addresses three research questions:

- **RQ1.** Which destination attributes — accommodation capacity, cultural heritage, domestic travel activity, recreational infrastructure, population — are associated with regional tourism employment in Uzbekistan?
- **RQ2.** Does regional tourism employment exhibit constant or decreasing returns to these inputs?
- **RQ3.** Do the associations differ between the cross-regional (between) and the within-region (over time) dimension?

The contribution is threefold. First, the paper assembles a balanced regional panel for 2018–2024 from official statistics. Second, it contrasts between-region and within-region estimates and uses a variance decomposition to explain why they differ. Third, it reports a full set of diagnostics and robustness checks, including estimators that turn out to be uninformative, so that the strength of the evidence is transparent. The rest of the paper is organised as follows. Section 2 describes the data and methods, Section 3 presents the results, Section 4 discusses them, and Section 5 concludes.

2. Materials and Methods

2.1. Data and variables

The unit of analysis is the region: the Republic of Karakalpakstan, 12 provinces (viloyats) and Tashkent city. The panel covers 2018–2024, the longest period for which all variables are available for every region under a consistent methodology. This gives a balanced panel of 14 regions $\times$ 7 years = 98 observations. Data come from the National Statistics Committee of the Republic of Uzbekistan (regional socio-economic statistics and tourism statistics) and the Tourism Committee of the Republic of Uzbekistan. Table 1 defines the variables.

Table 1. Variables used in the model

Symbol	Variable	Unit	Role
Y	Employment in legal entities of the tourism sector	persons	Outcome
K	Bed-places in hotels and similar accommodation	number	Produced capital
R	Objects of tangible cultural heritage	number	Heritage resource

Symbol	Variable	Unit	Role
D	Households that travelled within the country	thousand	Domestic demand
G	Parks of culture and recreation	number	Recreational infrastructure
N	Resident population	thousand persons	Labour and market base
C	Pandemic dummy (1 in 2020 and 2021)	0/1	External shock

The regions differ greatly in size (Table 2). Tourism employment ranges from 5,161 to 159,918 persons and bed-places from 371 to 28,348; both have coefficients of variation above 1.2. Heritage objects, domestic travel and population are more evenly distributed.

Table 2. Descriptive statistics (N = 98)

Variable	Mean	SD	Min	Max	CV
Tourism employment (Y), persons	24,412.3	30,360.9	5,161	159,918	1.24
Bed-places (K)	3,978.4	5,090.4	371	28,348	1.28
Heritage objects (R)	582.0	435.3	75	1,626	0.75
Domestic travel (D), thousand households	366.4	187.5	82.8	775.0	0.51
Recreation parks (G)	11.2	6.8	2	29	0.61
Population (N), thousand	2,474.2	959.2	815.9	4,208.5	0.39

Source: author's calculations based on National Statistics Committee data.

2.2. Model specification

Following the production-function approach used in regional tourism research (Paci & Marrocu, 2014), regional tourism employment is modelled as a multiplicative function of destination inputs:

$$Y_{it} = A K_{it}^{\beta_1} R_{it}^{\beta_2} D_{it}^{\beta_3} G_{it}^{\beta_4} N_{it}^{\beta_5} e^{u_{it}}$$

Taking logarithms gives the estimating equation:

$$\ln Y_{it} = \alpha_i + \beta_1 \ln K_{it} + \beta_2 \ln R_{it} + \beta_3 \ln D_{it} + \beta_4 \ln G_{it} + \beta_5 \ln N_{it} + \gamma C_t + \varepsilon_{it}$$

where α_i is a region-specific effect and ε_{it} is the error term. The coefficients are elasticities. Their sum, $\Sigma\beta$, measures returns to scale: $\Sigma\beta = 1$ indicates constant returns and $\Sigma\beta < 1$ decreasing returns.

2.3. Estimation strategy

Four estimators answer different questions (Baltagi, 2021; Wooldridge, 2010). Pooled OLS uses all variation. The between estimator uses only differences in regional means and captures long-run, cross-regional relationships. The fixed-effects (within) estimator uses only changes within each region over time and removes time-invariant regional characteristics. The random-effects estimator is a weighted combination of the two. Standard errors are clustered by region. Because regions share common shocks, Driscoll–Kraay standard errors, which are robust to cross-sectional dependence, are reported for the fixed-effects model (Driscoll & Kraay, 1998).

Model choice is guided by an F-test for individual effects, the Breusch–Pagan Lagrange multiplier test and the Mundlak (1978) test, a robust alternative to the Hausman (1978) test. Multicollinearity is checked with variance inflation factors, serial correlation with the Wooldridge test, heteroskedasticity with the Breusch–Pagan test, and normality with the Jarque–Bera test.

Robustness is examined in four ways: (i) a decomposition of each variable's variance into between and within components; (ii) a model with one-year lagged regressors; (iii) a fixed-effects model with Cochrane–Orcutt AR(1) correction (Cochrane & Orcutt, 1949); and (iv) dynamic panel estimators of Anderson and Hsiao (1981) and Arellano and Bond (1991), which address the bias of fixed effects in dynamic models (Nickell, 1981).

3. Results

3.1. Correlations

In logarithms, tourism employment is most strongly correlated with accommodation capacity ($r = 0.820$), followed by population (0.542), recreational infrastructure (0.523), domestic travel (0.422) and heritage (0.317). The strongest correlation among regressors is between domestic travel and population (0.766). The largest variance inflation factor is 3.47, well below the usual threshold of 5, so multicollinearity does not distort the estimates.

3.2. Main estimates

Table 3 reports the four main specifications. The pooled model explains 79.0% of the variance of log employment. Accommodation capacity has an elasticity of 0.546 ($p < 0.01$): regions with 10% more bed-places have, on average, about 5.5% higher tourism employment. Recreational infrastructure is positive at the 10% level (0.174). Heritage has a small negative coefficient (-0.234 , $p < 0.10$). Domestic travel and population are not significant.

Table 3. Panel estimates (dependent variable: $\ln Y$)

Variable	Pooled OLS	Fixed effects	Random effects	FE, Driscoll–Kraay SE
$\ln K$ — bed-places	0.5459*** (0.1354)	0.0257 (0.0471)	0.0554 (0.0672)	0.0257* (0.0145)
$\ln R$ — heritage objects	-0.2340^* (0.1219)	0.6776*** (0.1857)	0.1727 (0.1342)	0.6776** (0.3114)
$\ln D$ — domestic travel	0.1647 (0.2624)	0.0686** (0.0327)	0.0768** (0.0366)	0.0686 (0.0416)
$\ln G$ — recreation parks	0.1741* (0.0953)	-0.0124 (0.0333)	0.0306 (0.0362)	-0.0124 (0.0149)
$\ln N$ — population	0.2501 (0.3047)	-0.3423 (0.6297)	0.2864 (0.2533)	-0.3423 (0.3793)
Pandemic dummy	0.1216* (0.0714)	0.0039 (0.0163)	0.0204 (0.0186)	0.0039 (0.0247)
Constant	3.6574*** (0.8762)	7.7121* (4.3766)	5.5644*** (1.7433)	7.7121*** (1.1986)
Observations	98	98	98	98
R^2	0.790	0.119 (within)	0.153	0.119 (within)
$\Sigma\beta$ (returns to scale)	0.901	0.417	0.622	—

Notes: standard errors in parentheses, clustered by region except in the last column. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

The within dimension tells a different story. In the fixed-effects model the capacity elasticity drops to 0.026 and is not significant with clustered errors; with Driscoll–Kraay errors it is significant only at the 10% level. Domestic travel becomes positive and significant (0.069 in fixed effects, 0.077 in random effects, both $p < 0.05$). Heritage has a large positive fixed-effects coefficient (0.678), which Section 3.4 shows to be unreliable.

The sum of elasticities is below one in every specification. In the pooled model it is 0.901, which indicates decreasing returns: a proportional 10% increase in all inputs is associated with roughly a 9% increase in tourism employment.

3.3. Diagnostics

Table 4 summarises the specification tests. Individual effects are clearly present, so pooled OLS is rejected as the preferred model. The Mundlak test favours fixed over random effects. Residuals show

first-order serial correlation and heteroskedasticity, which justifies cluster-robust and Driscoll–Kraay inference.

Table 4. Specification and diagnostic tests

Test	Statistic	p-value	Conclusion
F-test for individual effects	$F = 72.257$	< 0.001	Pooled OLS rejected
Breusch–Pagan LM	$LM = 124.273$	< 0.001	Panel structure significant
Mundlak test	$F = 9.535$	0.0005	Fixed effects preferred
Largest VIF	3.47	—	No harmful multicollinearity
Wooldridge serial correlation	$\rho = 0.357$	0.0002	First-order autocorrelation
Breusch–Pagan heteroskedasticity	$LM = 44.11$	0.0009	Heteroskedastic errors
Jarque–Bera normality	$JB = 8.440$	0.0147	Residuals not normal

3.4. Why between and within estimates differ

Table 5 decomposes the standard deviation of each logged variable into between-region and within-region parts. Almost all variation is between regions. Only 1.83% of the variance of log employment and 8.91% of log capacity is within regions. For heritage the within share is just 0.34%: the number of registered heritage objects barely changes over time. The large fixed-effects heritage coefficient therefore rests on a handful of administrative register changes and is not interpreted as a causal effect. Domestic travel (18.43%) and recreation parks (27.21%) vary most over time.

Table 5. Between and within components of variation

Variable	Overall SD	Within SD	Between SD	Within share of variance, %
ln Y — employment	0.673	0.091	0.667	1.83
ln K — bed-places	0.944	0.282	0.901	8.91
ln R — heritage	0.744	0.043	0.742	0.34
ln D — domestic travel	0.560	0.240	0.505	18.43
ln G — recreation parks	0.694	0.362	0.592	27.21
ln N — population	0.461	0.042	0.459	0.81

3.5. Robustness

Table 6 compares alternative estimators. The between estimator, which uses only regional means, gives a capacity elasticity of 0.606 ($p < 0.01$) and an R^2 of 0.855. The cross-regional association between capacity and employment is therefore robust to the estimator. Within-region estimates of capacity stay small in the lagged and AR(1)-corrected models. The Cochrane–Orcutt correction estimates $\rho = 0.345$, but residual dependence remains ($\rho = 0.338$, $p = 0.004$), which supports the use of Driscoll–Kraay errors.

Table 6. Alternative estimators

Variable	Pooled	Between	Fixed effects	Lagged regressors	AR(1)-corrected FE	Arellano–Bond GMM
ln K	0.5459***	0.6058***	0.0257	0.0169	0.0033	0.1118*
ln R	−0.2340*	−0.2639	0.6776***	−0.9161*	0.9814***	1.5893
ln D	0.1647	0.2326	0.0686**	0.0175	0.0347	−0.0750
ln G	0.1741*	0.1774	−0.0124	−0.0215	0.0108	0.0235
ln N	0.2501	0.1691	−0.3423	−0.2112	−0.8192**	−1.2497
Observations	98	14	98	84	84	70

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. GMM coefficients are in first differences.

The heritage coefficient changes sign across within-region estimators (−0.916 with lagged regressors, 0.981 after AR(1) correction), which confirms that it is not identified by the data. The dynamic estimators are uninformative. The Anderson–Hsiao estimates have very large standard errors, indicating weak instruments, and the Arellano–Bond first-order autocorrelation test does not behave as expected ($p = 0.461$). With $T = 7$ and $N = 14$ the asymptotic properties of these estimators do not hold, so endogeneity cannot be removed with dynamic methods in this sample.

4. Discussion

Capacity explains where tourism jobs are, not how fast they grow (RQ1, RQ3). The between estimates show a strong and robust association between accommodation capacity and tourism employment: an elasticity of 0.55–0.61 across estimators. This is consistent with competitiveness models in which supporting infrastructure turns resources into a marketable product (Ritchie & Crouch, 2003; Dwyer & Kim, 2003). Within regions, however, the elasticity is close to zero. Two explanations fit the evidence. First, capacity changes slowly relative to the seven-year window, and its within-region variation is only 8.9% of the total, so the within estimator has little information to work with. Second, much of the new capacity since 2018 consists of hostels and family guest houses, whose share in total bed-places reached 43.2% by 2025, while the share of hotels fell from 93.1% in 2016 to 41.4%. Such establishments employ few people in registered legal entities, which is how employment is measured here. Either way, the short-run employment return to additional beds in an existing destination is small.

Domestic demand matters in the short run. Domestic travel activity is the only variable that is positive and significant in both the fixed- and random-effects models. A 10% rise in the number of travelling households is associated with roughly 0.7–0.8% higher tourism employment in the same region. Domestic tourism is often treated as a secondary market, yet Uzbekistan recorded 23.8 million domestic tourists in 2025, about twice the number of foreign visitors. Stronger domestic demand can therefore raise the utilisation of capacity that has already been built.

Decreasing returns signal the limit of extensive growth (RQ2). All specifications yield $\Sigma\beta < 1$; the pooled value of 0.901 is the most precisely estimated. Adding inputs in fixed proportions therefore yields less than proportional gains in employment. This result is in line with the international finding that tourism’s employment response weakens as destinations mature (Vuković et al., 2023) and with the life-cycle view of destination development (Butler, 1980). For Uzbekistan it implies that the next phase of growth should rely on utilisation, service quality and product diversification rather than on capacity alone.

Heritage is necessary but not sufficient. The negative pooled coefficient on heritage does not mean that heritage harms tourism. It reflects regions such as Kashkadarya, which has 1,468 heritage objects but few tourism enterprises and no classified hotels, and therefore low tourism employment. Heritage creates jobs only when it is packaged, interpreted and connected to visitor services, as destination management research emphasises (Buhalis, 2000). The fixed-effects estimate cannot inform this question because heritage registers hardly change over time.

Policy implications. Three priorities follow. First, investment appraisal for new accommodation should include regional utilisation rates, since an extra bed in an under-used destination adds little employment. Second, domestic tourism deserves explicit support — school-holiday packages, regional rail and road access, and off-season events — because it is the demand component with a measurable short-run employment effect. Third, heritage-rich but under-developed regions need interpretation, guiding and small-enterprise development rather than more beds.

Limitations. The panel is short ($T = 7$) and small ($N = 14$), which limits the precision of within-region estimates and rules out reliable dynamic estimation. Employment covers registered legal entities only and therefore misses informal and self-employed tourism work, which is likely to be large in guest-

house segments. The coefficients are associations, not causal effects; reverse causality from tourism employment to capacity investment cannot be excluded. Finally, the 2020–2021 pandemic years are controlled by a single dummy, which may not capture region-specific recovery paths. Longer series, district-level data and labour-force survey measures of tourism employment would address these limitations.

5. Conclusions

This study estimated the determinants of regional tourism employment in Uzbekistan using a balanced panel of 14 regions for 2018–2024. Three conclusions emerge.

1. Accommodation capacity is the main correlate of cross-regional differences in tourism employment, with an elasticity of 0.55–0.61 that is robust to the estimator. Within regions, the short-run employment response to added capacity is close to zero.
2. Domestic travel activity is positively and significantly associated with tourism employment within regions (elasticity 0.07–0.08), making it the most policy-relevant short-run lever in the model.
3. Elasticities sum to less than one (0.901 in the pooled model), which indicates decreasing returns. The capacity-led, extensive growth model is approaching its limits.

For policy-makers, the results argue for shifting from building new capacity towards raising the utilisation of existing capacity, supporting domestic demand and turning heritage assets into visitor products. For researchers, the paper shows that between- and within-region estimates can differ sharply in short regional panels, and that variance decomposition is a simple way to judge which estimates the data can support. Future work should use longer series, district-level data and broader employment measures, and should exploit policy changes, such as new air routes or visa reforms, to identify causal effects.

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