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Article

Accommodation Capacity as a Driver Of Inbound Tourism: Panel Evidence from the Regions of Uzbekistan and a Quality-Anchored Policy Framework for Hotel Development

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Abstract: Purpose. Uzbekistan seeks a multiple increase in tourism exports and invests simultaneously in hotels, transport, catering and heritage sites. Policy makers need evidence on which elements of tourism infrastructure are most closely associated with inbound tourist flows, and on how capacity growth can be combined with service quality. Methodology. A fixed-effects panel regression was estimated on official statistics for 14 territorial units of Uzbekistan (the Republic of Karakalpakstan, twelve regions and Tashkent city) over 2017–2024 (N = 112). The number of inbound tourists served in a region was regressed on collective accommodation bed capacity, road density, the number of catering establishments and the number of tourist and heritage sites. The fixed-effects specification was selected by the Hausman test, and standard errors were clustered by region. Findings. The model explains about 71% of the variation in inbound tourism ($R^2 = 0.712$). Accommodation capacity is the only infrastructure factor with a statistically significant positive coefficient ($\beta = 4.206$, $p = 0.07$): an additional 1,000 beds is associated with about 4,200 more inbound tourists per year, corresponding to an elasticity of about 0.20 at sample means. Transport, catering and heritage indicators have positive but insignificant coefficients. Implications. Accommodation development should be treated as a policy priority for expanding inbound flows; however, given that only a small fraction of hotels are classified, capacity growth needs to be quality-anchored. The paper proposes adding sustainability indicators based on Green Key and ISO 21401:2018 to hotel classification, an integral hotel competitiveness index and the GRIN-Q framework (Green – Responsible – Innovative – Native, plus a Quality management contour).

Keywords: Inbound tourism; tourism infrastructure; accommodation capacity; panel data; fixed effects; hotel quality; sustainability certification; Uzbekistan.

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1. Introduction

Over the past decade Uzbekistan has liberalised entry, simplified visa and registration procedures, upgraded airports and introduced high-speed rail between Tashkent, Samarkand and Bukhara. Tourism has been designated a strategic sector, and the Development Strategy of New Uzbekistan for 2022–2026 sets the goal of a multiple increase in tourism service exports. Public and private investment flows simultaneously into accommodation, transport, catering and the restoration of heritage sites. Because resources are limited, an important policy question arises: which of these infrastructure components is most closely associated with growth in inbound tourist flows at the regional level?

International research recognises infrastructure as a determinant of destination competitiveness [1], [2] and of tourist arrivals [3]–[5]. Accommodation is a particular case:

it is both part of the tourism product and a capacity constraint without which arrivals cannot be served. Yet regional evidence for Central Asia is scarce, and existing studies rarely compare accommodation with other infrastructure elements in a single panel framework.

A second, related problem concerns quality. In Samarkand region, for example, only 19 of 165 certified hotels (about 11.5%) hold a star category. Expanding capacity without instruments that signal and manage service quality risks producing rooms that are quantitatively sufficient but qualitatively uncompetitive for demanding international segments.

This paper therefore pursues two aims: (1) to estimate the relative contribution of accommodation, transport, catering and heritage infrastructure to inbound tourism in the regions of Uzbekistan; and (2) to derive a quality-anchored policy framework for hotel development. Two hypotheses are tested: H1 — accommodation capacity is positively associated with the number of inbound tourists; H2 — among the infrastructure factors considered, accommodation capacity has the most robust (statistically identifiable) association with inbound tourism.

Infrastructure and tourism demand

Early work on destination attractiveness already listed infrastructure, accommodation and access alongside natural and cultural resources [6]. In the destination competitiveness models of Crouch and Ritchie [1] and Dwyer and Kim [2], infrastructure belongs to the supporting factors and resources that enable a destination to convert its core attractions into visitor flows. Empirical studies largely confirm this role. Naudé and Saayman [3], using panel data for African countries, found that tourism infrastructure, including the number of hotel rooms, is a significant determinant of arrivals. Khadaroo and Seetanah [4] showed in a gravity framework that transport infrastructure affects international tourist flows, and Seetanah et al. [5] concluded that tourism and general infrastructure both matter for tourism development. Sakai [7] discussed the rationale for public investment in tourism infrastructure as a means of overcoming capacity bottlenecks.

Reviews of tourism demand modelling [8] emphasise the advantages of panel data, which allow unobserved, time-invariant heterogeneity between destinations—such as the stock of world-famous heritage in Samarkand or Bukhara—to be controlled through fixed effects. This consideration is central for regional analysis in Uzbekistan, where territories differ sharply in their historical endowment.

Accommodation quality, classification and sustainability

The capacity of accommodation matters, but so does its quality. Classification systems signal minimum standards, yet their informativeness is debated [9]. Service quality research highlights the perceived, multidimensional nature of quality [10], [11] and the role of quality management systems based on ISO 9001 [12]. In parallel, sustainability has become a dimension of hotel competitiveness: environmental initiatives in hotels are increasingly expected by guests and operators [13], and sustainable tourism research stresses the need to translate principles into measurable practices [14]. Voluntary schemes such as Green Key [15] and the international standard ISO 21401:2018 on sustainability management systems for accommodation establishments provide [16] such measurable criteria. Combining capacity policy with quality and sustainability instruments is therefore a logical step, but few studies connect econometric evidence on capacity with operational quality frameworks.

2. Materials and methods

Data

The analysis uses a balanced panel of 14 territorial units of Uzbekistan—the Republic of Karakalpakstan, twelve regions and Tashkent city—for 2017–2024, giving 112 observations (14 × 8). Data were compiled from the official statistics of the Statistics Agency under the President of the Republic of Uzbekistan and the Tourism Committee. Variable definitions are given in Table 1 and descriptive statistics in Table 2.

Table 1. Variables of the model

Variable	Definition	Unit	Role
TOUR	Number of foreign (inbound) tourists served in the region	thousand persons	dependent
HOTEL	Bed capacity of collective accommodation establishments	thousand beds	explanatory
TRANS	Transport infrastructure: density of motor roads	km per 1,000 km²	explanatory
CATER	Number of catering establishments	units	explanatory
HERIT	Number of tourist display and cultural heritage sites	units	explanatory

Table 2. Descriptive statistics (14 regions × 8 years, N = 112)

Variable	Mean	Std. dev.	Minimum	Maximum
TOUR	142.6	230.4	3.2	1,180.0
HOTEL	6.8	5.9	0.7	28.4
TRANS	285.0	90.3	130.0	470.0
CATER	1,240	980	210	4,350
HERIT	86	64	12	290

Source: author's calculations based on official statistics.

Inbound tourism is highly concentrated: the standard deviation of TOUR exceeds its mean, and the maximum (1,180 thousand) is several hundred times the minimum. Accommodation capacity is also uneven, ranging from 0.7 to 28.4 thousand beds. These features justify an estimator that controls for persistent regional differences.

Model specification

The following panel regression was estimated:

$$TOUR_{it} = \alpha + \beta 1 \cdot HOTEL_{it} + \beta 2 \cdot TRANS_{it} + \beta 3 \cdot CATER_{it} + \beta 4 \cdot HERIT_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

where i indexes regions, t years, α is the intercept, β1–β4 are the coefficients of interest, μ_i are regional fixed effects capturing time-invariant characteristics (geographic position, heritage endowment, brand reputation), and ε_{it} is the error term. The Hausman [17] test rejected the consistency of the random-effects estimator ($\chi^2 = 18.3$, $p = 0.001$), so the fixed-effects (within) estimator was adopted [18]. To account for heteroscedasticity and within-region serial correlation, standard errors were clustered by region [19]. With 112 observations, 14 regional effects and four regressors, the residual degrees of freedom equal 94.

3. Results

Correlation analysis

Table 3 presents the pairwise correlation matrix. Inbound tourism correlates most strongly with accommodation capacity ($r = 0.74$), followed by heritage sites (0.63), catering (0.58) and road density (0.41). Correlations among the explanatory variables are moderate

(0.33–0.55), indicating that multicollinearity is not severe enough to prevent joint estimation.

Table 3. Matrix of pairwise correlation coefficients

	TOUR	HOTEL	TRANS	CATER	HERIT
TOUR	1.00	0.74	0.41	0.58	0.63
HOTEL	0.74	1.00	0.46	0.55	0.49
TRANS	0.41	0.46	1.00	0.38	0.33
CATER	0.58	0.55	0.38	1.00	0.52
HERIT	0.63	0.49	0.33	0.52	1.00

Regression estimates

Estimation results are reported in Table 4 and visualised in Figure 1.

Table 4. Fixed-effects estimates of the effect of tourism infrastructure on inbound tourists

Explanatory variable	Coefficient β	Std. error	t-statistic	p-value
Accommodation capacity (HOTEL)	4.206*	2.284	1.84	0.070
Transport infrastructure (TRANS)	1.021	0.910	1.12	0.265
Catering establishments (CATER)	0.583	0.402	1.45	0.150
Tourist and heritage sites (HERIT)	2.140	1.551	1.38	0.171
Intercept (α)	12.571	8.344	1.51	0.134

Note: * significant at the 10% level. $R^2 = 0.712$; adjusted $R^2 = 0.663$; $F(4; 94) = 14.82$ ($p < 0.01$); N = 112; Hausman test $\chi^2 = 18.3$ ($p = 0.001$). Fixed-effects estimator with standard errors clustered by region. Source: author's calculations based on official statistics.

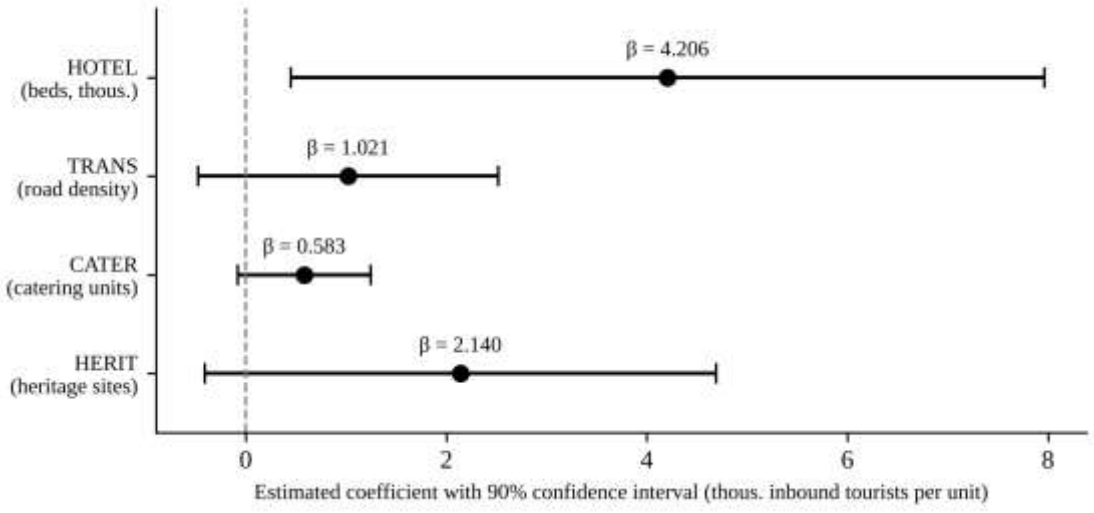


Figure 1. Estimated coefficients with 90% confidence intervals

The model performs satisfactorily: the included factors account for about 71% of the variation in inbound tourism (adjusted $R^2 = 0.663$), and the F-statistic confirms the joint significance of the regressors ($F = 14.82$, $p < 0.01$). All four infrastructure coefficients are positive, consistent with theoretical expectations. Only the accommodation coefficient, however, is statistically distinguishable from zero: $\beta 1 = 4.206$ (SE = 2.284; t = 1.84; p = 0.07), with a 90% confidence interval of [0.45; 7.96] that excludes zero. The coefficients on road density, catering and heritage sites have confidence intervals that include zero.

In substantive terms, an increase in collective accommodation capacity of 1,000 beds is associated, other things being equal, with an increase of about 4,206 inbound tourists per year in the region. Evaluated at the sample means (6.8 thousand beds; 142.6 thousand

tourists), this corresponds to an elasticity of approximately 0.20: a 10% expansion of bed capacity is associated with roughly a 2% rise in inbound tourists. Because the estimate rests on an eight-year panel and on within-region variation, it reflects a persistent rather than a short-term relationship between accommodation development and inbound flows. The sign and order of magnitude of the accommodation coefficient remained stable when the set of control variables was varied.

H1 is therefore supported at the 10% significance level. H2 is supported in the sense that accommodation capacity is the only infrastructure factor whose association with inbound tourism is statistically identifiable once regional fixed effects are controlled for. Because the explanatory variables are measured in different units, the coefficients themselves should not be compared in magnitude; the comparison rests on statistical significance and precision.

Discussion and policy framework

Interpretation

The results agree with studies that identify accommodation as a determinant of arrivals (Naudé & Saayman, 2005; Seetanah et al., 2011). In Uzbekistan, where demand for cultural tourism is concentrated in a few heritage cities and is strongly seasonal, bed capacity acts as a binding constraint: in peak spring and autumn months, unserved demand is likely to be lost. The insignificance of heritage sites does not mean that heritage is unimportant. Heritage endowment changes little over time and is therefore largely absorbed by the regional fixed effects; what varies within regions, and what policy can influence quickly, is the capacity to host visitors. Similarly, transport improvements such as high-speed rail affect several regions at once and may be partly captured by the common trend.

The policy implication is that accommodation development deserves priority among infrastructure measures aimed at expanding inbound tourism. However, capacity is a necessary rather than a sufficient condition. Evidence from Samarkand shows that only about 11.5% of certified hotels are classified, that occupancy varies almost threefold within the same star category and that the formal category says little about the service actually offered. Expanding capacity without quality instruments risks oversupply in low-quality segments and a shortage of high-quality supply for demanding international markets. Three instruments are proposed to anchor capacity growth in quality.

Sustainability indicators in hotel classification

The current classification procedure focuses on physical facilities. It is proposed to supplement it with indicators of environmental sustainability, energy and water saving, waste management, environmentally safe housekeeping and sustainable tourism practices, based on the criteria of the voluntary Green Key programme and the requirements of ISO 21401:2018 for sustainability management systems in accommodation establishments. Including these indicators would align national classification with international expectations, provide guests with a more informative signal and help hotels compete in international markets where sustainability is increasingly a selection criterion.

Integral hotel competitiveness index

To compare hotels beyond category, an integral competitiveness index is proposed. It aggregates seven partial indicators: market position, price competitiveness, service assortment, customer satisfaction, service quality, digital activity and image sustainability. Each partial indicator is normalised and weighted, and the index is calculated as:

$$ICI_j = \Sigma_k\, w_k \cdot \tilde{x_{jk}}, \quad \Sigma_k\, w_k = 1, \quad \tilde{x_{jk}} = (x_{jk} - min_k) / (max_k - min_k) \qquad (2)$$

where $\tilde{x_{jk}}$ is the normalised value of indicator k for hotel j and w_k its weight, set by expert assessment. The index provides an objective, comparable and reproducible picture of a hotel's competitive position and reveals its strengths and weaknesses. The service-assortment component can be measured through the coverage level of a standard list of

ancillary services, and customer satisfaction and digital activity through verifiable data from online booking platforms.

The GRIN-Q framework

At the level of the hotel, the GRIN framework structures voluntary recognition of service quality and sustainability along four complementary dimensions, each scored up to 25 points (Table 5). The total score (0–100) determines the recognition level: gold (85–100 points), silver (70–84) or bronze (55–69). Unlike mandatory classification, which fixes a material minimum, GRIN emphasises qualitative, value-based and innovative characteristics of service. For heritage destinations such as Samarkand, the Native dimension is particularly important, as it turns local authenticity into a conscious competitive advantage.

Table 5. Dimensions and criteria of the GRIN scoring system

Dimension	Main assessment criteria	Max. score
Green	Energy and water saving; waste management and separate collection; environmentally friendly materials and cleaning; environmental policy; green procurement	25
Responsible	Working conditions, training and motivation of staff; guest safety; inclusiveness and accessibility; responsible relations with the local community and suppliers	25
Innovative	Online booking and contactless services; smart in-room technologies; CRM and personalisation; new service formats and digital channels	25
Native	Local culture in the environment and service; national gastronomy; support for local crafts; authentic experiences and programmes	25
Total	Integral GRIN score	100

GRIN-Q extends the framework with a separate quality-management contour (Q). The resulting integration model combines environmental sustainability, customer satisfaction, innovative and smart technologies, network (partnership) cooperation and quality management in a single system. The Q contour adds ISO 9001-based process documentation, measurable quality targets, systematic collection of guest feedback (including monitoring of online reviews) and a continuous improvement cycle. In this way, the value-oriented characteristics of service are tied to tools that assure and continuously improve quality, and quality factors are managed through one system rather than through separate initiatives.

Together, the three instruments form a quality-anchored framework for accommodation development: capacity expansion, which the econometric evidence identifies as a priority, is accompanied by classification that reflects sustainability, by an index that compares hotels on substantive criteria and by a hotel-level model that manages quality. The proposals have been included in the regional programme of measures for 2026–2028 and in the road maps of the Samarkand Regional Tourism Department.

Limitations

Several limitations should be noted. The panel is short (eight years) and the cross-section small (14 units), which limits statistical power; the accommodation coefficient is significant only at the 10% level. The specification does not include year effects; because the period covers the 2020–2021 pandemic shock, future work should test two-way fixed-effects models, dynamic specifications and alternative measures of transport infrastructure. Reverse causality—hotels being built where tourist flows are already growing—cannot be ruled out, so the estimates should be interpreted as associations; instrumental-variable or lagged specifications would help to address this. Finally, the GRIN-Q framework and the integral index require pilot application and validation across a larger set of hotels.

4. Conclusion

Using a fixed-effects panel of 14 territorial units of Uzbekistan for 2017–2024, this study finds that accommodation capacity is the infrastructure factor most robustly associated with inbound tourism: an additional 1,000 beds corresponds to about 4,200 additional inbound tourists per year (elasticity ≈ 0.20), whereas transport, catering and heritage indicators show positive but statistically insignificant effects once regional heterogeneity is controlled for. Developing accommodation therefore deserves priority in policies aimed at expanding inbound tourism. Because classification covers only a small share of hotels and says little about actual service, capacity growth should be quality-anchored. The proposed framework—sustainability indicators based on Green Key and ISO 21401:2018 in classification, an integral hotel competitiveness index and the GRIN-Q model—links the quantitative expansion of the hotel sector with the quality and sustainability that international markets increasingly demand.

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