Climate and Its Effects on International Tourism to Uzbekistan: Insights from Gravity Model Studies

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Objectives | Tourism industry is highly sensitive to climatic conditions and can significantly affect tourist's behaviour and destination choice. This study analyzes the impact of climate variables such as temperature and precipitation on tourist arrivals to Uzbekistan from 67 countries using traditional gravity models for the period 2008-2018.

Methodology | The gravity model is applied to estimate the impact of climate on tourism flows. The gravity equation is extensively used in social science (Ibragimov et al., 2021; Rosselló & Santana-Gallego, 2014). Following the recent studies, the baseline model of the gravity model used is as follows:

$$LnQ_{ijt} = \beta_0 + \beta_1 lnGDPpc_{it} + \beta_2 lnGDPpc_{jt} + \beta_3 lnPOPULATION_{it} +$$

$$\beta_4 lnPOPULATION_{jt} + \beta_5 lnDISTANCE_{ij} + \beta_6 TEMP_i + \beta_7 TEMP_j + +\beta_8 PREC_i + \beta_9 PREC_j + \mu_{ijt} \quad (1)$$

Where Ln defines natural logarithms; i and j are sub − indexes that denote the country of origin and destination, t is an eleven-year time period (2008-2018); μ_{ijt} is a well-behaved disturbance term. According to Hausman test, random effect model has been found an appropriate econometric technique to estimate the gravity equation.

Data specifications were divided into variables of interest and control variables. Q_{ijt} shows the dependent variable explaining the number of tourist arrivals to Uzbekistan from 67 countries for the period 2008-2018. Control variables are distance, GDP per capita and population. $DISTANCE_{ij}$ measures the distance between capital cities from the countries of origin to the destination in wide circles. $lnGDPpc_{it}$ and $lnGDPpc_{jt}$ represent GDP per capita of origin countries and the destination at time t. $lnPOPULATION_{it}$ and $lnPOPULATION_{jt}$ refer to the density of population of origin countries

and the destination at time t. GDP per capita and the number of population were taken from World Bank Indicators. Data about distance between capital cities were obtained from Research and Expertise on the World Economy (CEPII, n.d.). The variables of interests $TEMP_i$ and $TEMP_j$ are the annual average temperature of the countries of origin and destination in degree Celsius. $PREC_i$ and $PREC_j$ are the total average precipitation of the countries of origin and destination in millimeters. Climate variables were taken from Climate Change Knowledge Portal.

Main Results and Contributions | Table 1 shows the obtained outcome of gravity equation (1) using the random effect model.

Table 1 | Random effect model

lntou	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnpoporig	.9686599	.1780333	5.44	0.000	.6197209	1.317599
lnpopdest	4.588406	1.450124	3.16	0.002	1.746215	7.430597
lngdpdest	−1.096363	.3223842	−3.40	0.001	−1.728224	−.4645015
lndist	−2.803333	.4391879	−6.38	0.000	−3.664125	−1.94254
temp_orig	−.0389632	.0358334	−1.09	0.000	−.1091953	.0312689
prec_orig	.0039529	.0033774	1.17	0.002	−.0026667	.0105725
cons	−57.41424	24.62878	−2.33	0.020	−105.6858	−9.142726

Number of obs = 482
R squared = 0.4571

The result shows a medium goodness of fit, the dependent variable was explained 45% by a set of explanatory variables. Gross domestic product per capita (*lngdpdest*) has a negative impact on international tourist arrivals to Uzbekistan, suggesting that a slump in economic output in Uzbekistan leads to a reduction of personal income. Transport cost (*lndist*) has a negative effect on tourism demand of Uzbekistan, indicating that tourists prefer nearby destinations. The effect of climate is so small, specifically average temperature and rainfall in origin countries are only variables found to be statistically significant at 5% level. Average temperature (*temp_orig*) in the origin countries negatively affects the number of international tourist arrivals to Uzbekistan while higher temperature in origin countries tends to boost domestic tourism than overseas travel. However, the higher frequency of rainfall in the origin (*prec_orig*) countries encourage tourists to visit Uzbekistan.

Limitations | The study used the most available data obtained from the UNWTO statistics database, but future research with updated data is recommended for more accurate insights.

Conclusions | The number of travellers visiting Uzbekistan has increased dramatically due to the improvement of tourism infrastructure, quality of services and advertisement. However, some factors must be taken into consideration which deters increasing this number eventually, such as high transportation cost, high temperature and precipitation. This study shows the impact of climate variables on international tourist arrivals in Uzbekistan for the period 2008-2018 using the gravity model. Gravity determinants are highly approved theory and well explained in the estimated model. The results reveal that tourism demand of Uzbekistan is not highly dependent on climate issues however, average temperature and precipitation have significant effects. The fluctuation of average temperature and precipitation in the origin countries could change slightly the tourism demand of Uzbekistan but the potential influence rate is so small. Moreover, travel cost is a factor which tends to reduce international tourists in Uzbekistan by 2%. Hence, policy makers should develop regulations to lessen the travel costs for tourists who are traveling from long-haul source markets during high tourism seasons (i. e. March-May, September - October) in Uzbekistan.

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