



# Analysis of the spatial impact of the tourism industry on Vietnam's economic growth

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## Abstract

Based on the study of spatial characteristics of Vietnam's tourism industry in the 2007-2018 period, the authors built a spatial table data model to analyze the spatial impact of tourism on Vietnam's economic growth. The research results indicate that Vietnam's tourism industry has convergence and there exists a positive spatial relationship, with provinces with highly developed tourism industries concentrated mainly in the two regions of the Red river delta and the Southeast region. In addition, based on the results of spatial regression, it can be seen that the regional tourism development has little effect on the tourism development of neighboring areas, but the extent of the tourism industry's influence on growth of local economy is huge. Tourism is recognized around the world as one of the largest and fastest growing economic sectors. In developing countries such as Vietnam, tourism is seen as a tool to encourage economic development and it also serves to alleviate poverty

**Keywords:** Spatial effect, spatial correlation, SAR model, Vietnam.

## Introduction

In recent years, the tourism industry has developed rapidly and become a key economic sector of Vietnam. The level of influence and contribution of the tourism industry to the national economy has been increasing. There are many reasons for the rapid development of tourism. Based on the theory of economic growth, population, land, capital, human resources, market mechanisms, state policies are important factors for economic development. However, the typical feature of the tourism industry is that the production and consumption processes occur simultaneously, so for the tourism industry, the geographical location, accessibility to destinations are an important factor promoting the development. The question is whether the distance between the two regions affects the growth quality of that area or not, and whether the development of the area affects the



neighborhood. Therefore, in the process of studying the impact of the tourism industry on economic growth, it is necessary to consider and put in the spatial correlation between tourist destinations. The study was based on convergence theory and spatial correlation, through statistics of the number of tourists of 63 provinces and cities in the period 2007-2018 to conduct an analysis of the convergence level of the tourism industry; examine the spatial dependence of Vietnam's tourism industry; and to develop a spatial econometric model to evaluate the spatial effects of the tourism industry on Vietnam's economic growth.

## **Theoretical basis**

### **Some definitions of convergence and spatial correlation**

Neoclassical growth theory has shown that there is conditional convergence in economic growth among different economic regions. Lucas (1988) assumes that capital is constant with scale, the rate of output growth per capita and the initial level are independent variables, which also leads to the assumption of the existence of convergence. Convergence between economies is understood as the trend of balancing per capita income across economies over time. Convergent research will help differentiate growth theories according to its predictions of economic growth, building an appropriate spatial econometric model to assess a country's development situation or an economic region. Spatial correlation refers to the similarity of the same variable in different spatial locations, spatial correlation is used to test a variable in a spatial location with that variable in the neighborhood existing spatial dependence or not.

## **Literature review**

The use of a spatial econometric model in the study of economic development of a country is used by many domestic and foreign researchers in their research projects. Pham Anh Tuan (2017), through theoretical basis of convergence, conducted an analysis of the convergence of income, productivity and spatial spreading role of FDI. The research results have shown that income per capita has a positive convergence, meaning that the economic development of a province has a positive effect on the economy of neighboring provinces and vice versa. Nguyen Khac Minh and Pham Van Khanh (2014) assessed the convergence of agricultural labor productivity growth. The research results have shown that the level of regional convergence changed drastically, economic growth was rapid in 1991-1996, and then gradually decreased in the later period. Mundell and Fleming (1963) established the Mundell-Fleming model to analyze the spillover effects of GDP, to analyze the process of the effects of variables on the national economy, later many other scholars use this model to analyze the GDP overflow effect. Carlino and Defina (1995) used the data of per capita income of the United States during 1929-1990 to conduct research on the effects of regional economic growth of the United States. The research results have shown that there is a spatial correlation of large areas in 8 zones of the United States, the level of spillover effects is very large.

Gang XiaoHong and Li GuoPing (2005) formulated an econometric model, testing the spillover effects of foreign exchange income of the tourism industry in Xi'an City (China) on economic growth, the research results show the spillover of Xi'an city tourism industry to economic growth. Li HangFei et al. (2012) based on spatial latency model, conducted a survey of the role of tourism development in economic growth in Guangdong province (China). Wu YuWu (2014), based on data from 31 Chinese provinces, conducted the spatial correlation test of regional tourism economic growth, the research results show that the level of capital impact on economic growth tourism is greater than the influence of labor force, in addition the author also shows the spillover effect between tourism investment capital of neighboring provinces and tourism economic growth.



## Data and research methods

### Data

The authors used the Logarithm of GDP to represent Vietnam's economic growth, the Logarithm of the number of tourist arrivals as a proxy for the development of the tourism industry. Data collected from 2007 to 2018 of 63 provinces and cities in Vietnam are used to assess the spatial effects of the tourism industry on Vietnam's economic growth.

### Research Methods

#### Several methods of measurement of spatial correlation

Tobler (1970), the famous geographer, proposed the law "adjacent geographic units have a higher degree of spatial dependence than remote geographic units". Studies have shown that, from a geospatial perspective, the development of economic sectors interact with each other, that is, the economic development of this region has a or negative positive influence on its neighborhood. Therefore, the testing of spatial correlation among regions plays an important role in regional economic growth. Usually the statistical indicators used to measure spatial correlation include Moran's I, Geary'C and Getis & Ord G.

#### Moran's I index

$$I = \frac{N \sum_{i=1}^n \sum_{j=1}^n W_{ij} (X_i - \bar{X})(X_j - \bar{X})}{(\sum_{i=1}^n \sum_{j=1}^n W_{ij}) \sum_{j=1}^n (X_i - \bar{X})^2}$$

In which, I is the spatial correlation index; X is the variable research value of region i and area j;  $\bar{X}$  is the average value of the variable X; n is the number of observations;  $W_{ij}$  is the spatial weight between area i and area j (if area i and area j are adjacent  $W_{ij} = 1$ , if area i and area j are not adjacent to each other  $W_{ij} = 0$ ). Cliff and Ord (1972) demonstrate that Moran's I statistics have asymptotic distribution as the normal distribution. The Moran's I coefficient always receives values from -1 to 1. If  $I > 0$ , there exists a positive correlation in space; If  $I < 0$ , there exists a negative spatial correlation; If  $I = 0$ , there is no correlation.

#### Geary'C Index

$$C = \frac{(n - 1) \sum_{i=1}^n \sum_{j=1}^n W_{ij} (X_i - X_j)^2}{2(\sum_{i=1}^n \sum_{j=1}^n W_{ij}) \sum_{j=1}^n (X_i - \bar{X})^2}$$

The Geary' C index always receives values from 0 to 2; If  $C < 1$ , there exists a positive spatial correlation; If  $C > 1$ , there is a negative spatial correlation; If  $C = 1$ , there is no correlation.

#### Getis & Ord's G index



$$C = \frac{\sum_{i=1}^n \sum_{j=1}^n W_{ij} X_i X_j}{\sum_{i=1}^n \sum_{i \neq j}^n X_i X_j}$$

If  $C < 1$ , the two regions are strongly correlated; If  $C > 1$  the 2 regions have a small correlation.

### Spatial econometric model

The non-spatial regression model usually ignores the spatial dependence between variables, so it is easy to lead to the "pseudo-regression" problem, so before conducting the space regression, the variables are tested for spatial correlation. The Spatial autoregressive model (SAR) was introduced by Cliff & Ord (1973, 1981), then expanded by Anselin (1988). The model was designed to describe the spatial correlation between spatial data collected with the sense that the dependent variable value in region  $i$  affects region  $j$  if the two regions have no correlation. The space is described in the weight matrix. The model is shown in the following matrix:  $Y = pW_y + \varepsilon$ ;  $\varepsilon \sim N(0, \delta^2 I_n)$  Where:  $y$  is the vector ( $n \times 1$ ) of the dependent variable's value, in the form of deviation from the average value to reduce the blocking factor from the model;  $W$  is a space-weighted, matrix ( $m \times n$ ) weighted matrix;  $W_y$  is the spatial lag variable of the dependent variable, which is the weighted average of the dependent variable values in the neighborhood;  $p$  is the regression coefficient of the spatial delay variable  $W_y$ , indicating the impact of the spatial lag variable on the dependent variable to be studied;  $\varepsilon$  is the vector ( $n \times 1$ ) of the errors.

### Research results

#### Testing of spatial correlation

To test the spatial correlation of the tourism industry in Vietnam, the article uses a combination of Moran's  $I$  and Getis & Ord's  $G$  indexes, the results are shown in Table 1:

**Table 1: Moran's I and Getis & Ord's G indexes**

| Year | Moran's I | Z     | P     | Getis & Ord's G | Z     | P     |
|------|-----------|-------|-------|-----------------|-------|-------|
| 2007 | 0.126     | 2.549 | 0.011 | 0.149           | 3.429 | 0.001 |
| 2008 | 0.158     | 2.993 | 0.003 | 0.153           | 3.628 | 0.000 |
| 2009 | 0.146     | 2.646 | 0.008 | 0.146           | 3.326 | 0.001 |
| 2010 | 0.169     | 2.851 | 0.004 | 0.136           | 3.286 | 0.001 |
| 2011 | 0.198     | 3.212 | 0.001 | 0.134           | 3.443 | 0.001 |
| 2012 | 0.215     | 3.513 | 0.000 | 0.145           | 3.777 | 0.000 |
| 2013 | 0.195     | 3.295 | 0.001 | 0.140           | 3.529 | 0.000 |
| 2014 | 0.201     | 3.298 | 0.001 | 0.135           | 3.482 | 0.000 |
| 2015 | 0.185     | 3.022 | 0.003 | 0.130           | 3.225 | 0.001 |
| 2016 | 0.205     | 3.344 | 0.001 | 0.129           | 3.372 | 0.001 |
| 2017 | 0.198     | 3.345 | 0.001 | 0.135           | 3.444 | 0.001 |
| 2018 | 0.197     | 3.329 | 0.001 | 0.136           | 3.478 | 0.001 |

Source: According to calculations by the research team

Through Table 1, we can see that at the statistic level of significance of 5%, all values are positive, proving that Vietnam's tourism industry exists a positive correlation in space. The largest Moran's I index is 0.215, the smallest is 0.126, proving that the impact relationship of tourism industry among provinces and cities in Vietnam has no mutation, Moran's I index is relatively small, indicating that the impact inter-relationship of the tourism industry between provinces in Vietnam is not large. In addition, based on the testing results of the Z value, it shows that Vietnam's tourism industry has a positive spatial relationship, the test results also clearly show that Vietnam's tourism industry has a phenomenon of space gathering. However, Moran's I index only shows the convergence characteristics of Vietnam's tourism industry on a comprehensive scale, not the spatial correlation of tourism in the provinces and cities of Vietnam. Therefore, the study used the Local Moran's I index to conduct spatial correlation analysis of 63 provinces and cities of Vietnam, the results are shown in Figure 1.

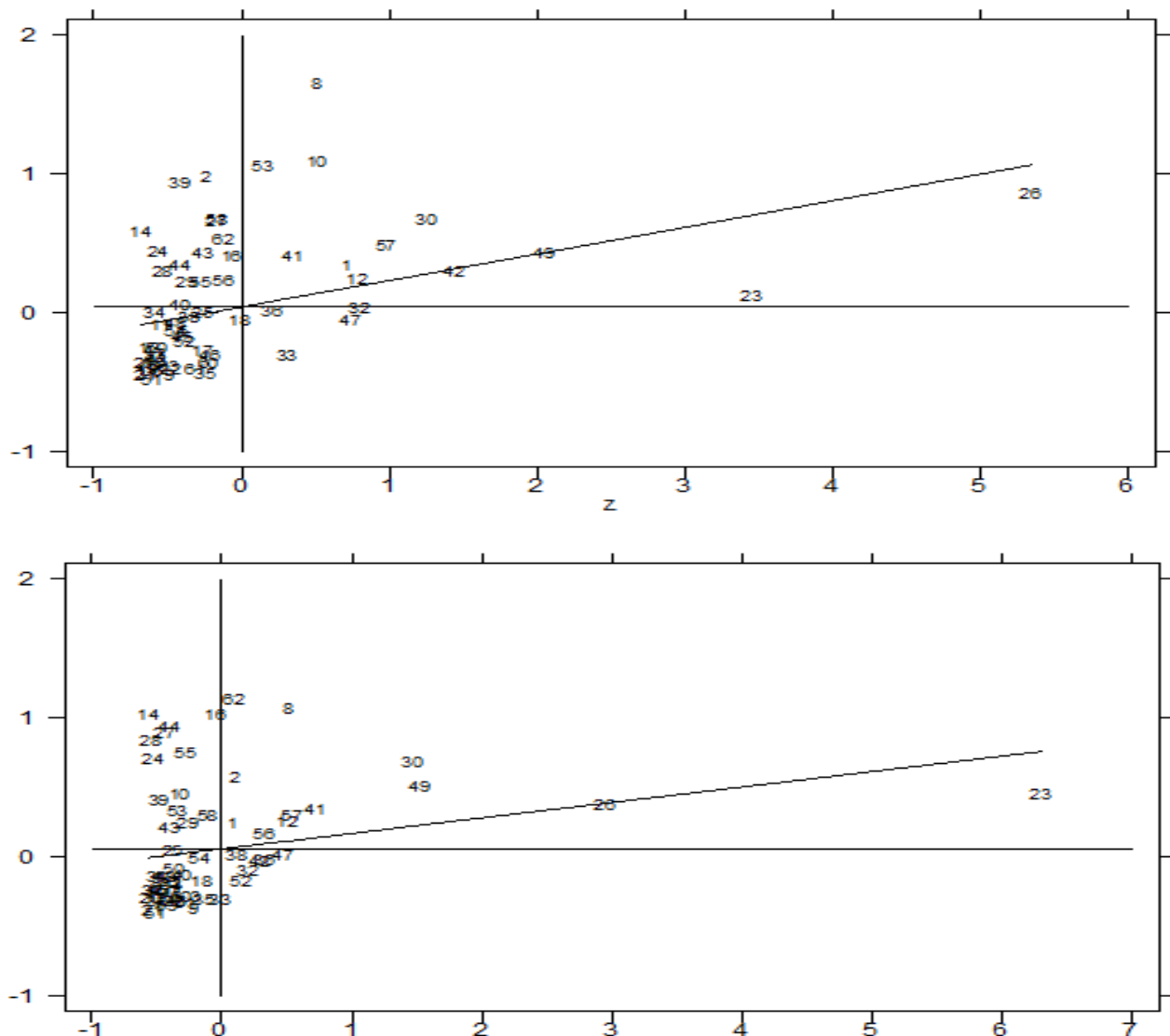


Figure 1: Moran's I index and LISA image of Vietnam's tourism industry in 2007 and 2018

Source: According to calculations by the research team



As shown in Figure 1, as of 2018, the provinces with the most developed tourism industry are concentrated mainly in the two regions and the Red River Delta and the Southeast. These are areas with developed economies, infrastructure and convenient transportation, facilitating the development of industries. Provinces with underdeveloped tourism are concentrated in mountainous provinces, the central region, the Central Highlands region, and the Mekong River Delta region. It can be seen in these areas, the infrastructure and transportation are still limited, hindering the development of the tourism industry. Spatial distribution of tourism industry in provinces is shown in Table 2:

**Table 2: Spatial distribution of Vietnam's tourism industry**

| Year | H-H  | L-H   | L-L  | H-L  |
|------|--|---|--|--|
| 2007 | Da Nang, Dong Nai, Ba Ria - Vung Tau, Binh Thuan, Hanoi, Ho Chi Minh, Hai Phong, Nghe An, Quang Ninh, Thua Thien Hue, Thanh Hoa, Vinh Phuc | Binh Duong, Bac Giang, Bac Ninh, Ha Nam, Hoa Binh, Hung Yen, Hai Duong, Long An, Ninh Thuan, Phu Tho, Tay Ninh, Thai Nguyen and Tien Giang.                     | Dong Thap, Dak Nong, Dak Lak, Dien Bien, An Giang, Binh Dinh, Binh Phuoc, Bac Lieu, Bac Can, Ben Tre, Ca Mau, Cao Bang, Can Tho, Gia Lai, Ha Giang, Hau Giang, Kien Giang, Kon Tum, Lao Cai, Lai Chau, Nam Dinh, Phu Yen, Quang Binh, Quang Ngai, Quang Tri, Soc Trang, Thai Binh, Tra Vinh, Tuyen Quang, Vinh Long and Yen Bai. | Ha Tinh, Khanh Hoa, Lam Dong, Lang Son, Ninh Binh, Quang Nam and Son La. |
| 2018 | Da Nang, Ba Ria - Vung Tau, Binh Duong, Binh Thuan, Hanoi, Ho Chi Minh, Hai Phong, Nghe An, Ninh Binh, Quang Ninh, Tay Ninh, Thanh Hoa     | Dong Nai, Bac Giang, Bac Ninh, Ha Nam, Hoa Binh, Hung Yen, Hai Duong, Long An, Nam Dinh, Ninh Thuan Phu Tho, Thai Nguyen, Thua Thien Hue, Tien Giang, Vinh Phuc | Dong Thap, Dak Nong, Dak Lak, Dien Bien, An Giang, Binh Dinh, Binh Phuoc, Bac Lieu, Bac Can, Ben Tre, Ca Mau, Cao Bang, Can Tho, Gia Lai, Ha Giang, Ha Tinh, Hau Giang, Lao Cai, Lai Chau, Lang Son, Phu Yen, Quang Binh, Quang Ngai, Quang Tri, Soc Trang, Son La, Thai Binh, Tra Vinh, Tuyen Quang, Vinh Long and Yen Bai      | Kien Giang, Kon Tum, Lam Dong and Quang Nam                              |

Source: According to calculations by the research team

In which: H-H is the developed area of High-High; L-H is the Low-High developed area, L-L is the Low-Low developed area; H-L is the developed area of High-Low.

### Measure the spatial effect of tourism on economic growth

The study used the logarithm function of GDP (LnGDP) to represent Vietnam's economic growth; The logarithm of tourist arrivals (Ln Travel) represents the development of the tourism industry. Combining OLS regression method, spatial self-regression model (SAR) and spatial error model (SEM) to assess the impact of tourism on Vietnam's economic growth, the results are shown in Table 3:

**Table 3: Regression results**

| Variable | OLS         |        |       | SAR         |      |       | SEM         |      |       |
|----------|-------------|--------|-------|-------------|------|-------|-------------|------|-------|
|          | Coefficient | t      | P     | Coefficient | z    | P     | Coefficient | Z    | P     |
| W-LnGDP  |             |        |       | 0.055       | 4.60 | 0.000 |             |      |       |
| Constant | 2.206       | 44.127 | 0.000 | 2.058       | 8.22 | 0.000 | 2.236       | 9.67 | 0.000 |
| LnTravel | 0.527       | 23.176 | 0.000 | 0.390       | 6.31 | 0.000 | 0.391       | 6.31 | 0.000 |
| Lambda   |             |        |       |             |      |       | 0.070       | 4.61 | 0.000 |

Source: According to calculations by the research team



By comparing the regression results of the models, it can be seen that the use of a spatial regression model compared to conventional regression model has more realistic results, in which the use of SAR model to assess the impact of the tourism industry on Vietnam's economic growth is the most optimal when compared to the SEM model. Therefore, the study used the SAR model to analyze the impact of the tourism industry on Vietnam's economic growth.

**Table 4: Spatial impacts of Vietnam's tourism industry**

| Year | W-LNGDP (P)       | C (P)             | LNTRAVEL (P)      |
|------|-------------------|-------------------|-------------------|
| 2007 | 0.0963463 (0.000) | 0.79432 (0.000)   | 0.3765892 (0.000) |
| 2008 | 0.091196 (0.000)  | 0.8830449 (0.000) | 0.3954069 (0.000) |
| 2009 | 0.0845895 (0.000) | 1.049738 (0.000)  | 0.3818636 (0.000) |
| 2010 | 0.0771822 (0.000) | 1.239826 (0.000)  | 0.3874832 (0.000) |
| 2011 | 0.0717427 (0.000) | 1.365255 (0.000)  | 0.392766 (0.000)  |
| 2012 | 0.0672328 (0.000) | 1.529434 (0.000)  | 0.3858564 (0.000) |
| 2013 | 0.0669398 (0.000) | 1.650664 (0.000)  | 0.403833 (0.000)  |
| 2014 | 0.0622373 (0.000) | 1.767006 (0.000)  | 0.3999405 (0.000) |
| 2015 | 0.0601321 (0.000) | 1.867749 (0.000)  | 0.3898568 (0.000) |
| 2016 | 0.0577156 (0.000) | 1.949724 (0.000)  | 0.3906293 (0.000) |
| 2017 | 0.056828 (0.000)  | 1.978092 (0.000)  | 0.3997294 (0.000) |
| 2018 | 0.0554659 (0.000) | 2.057587 (0.000)  | 0.3902282 (0.000) |

Source: According to calculations by the research team

From the results of the spatial lag model, we can see that the spillover effect of Vietnam's economic growth is relatively small and tends to decrease, proving that the local economic impact has not had much of an impact on the economic development of its neighboring provinces. In addition, from the regression coefficient of the variable, it can be seen that the influence of the tourism industry on the local economic growth is very large, the influence of the tourism industry on the local economic growth is over 37%.

## Conclusion

The paper used panel data of 63 provinces and cities of Vietnam in the period of 2007-2018, and applied a spatial regression model and variance model to analyze the spatial effect of tourism on economic growth. The research results are obtained in the following aspects:

Through Moran's I index and LISA image, it can be seen that Vietnam's tourism industry has convergence and positive spatial relationship, and the provinces and cities with tourism development are concentrated mainly in two areas of the Red River Delta and the Southeast region.

Unlike some other countries in the region, where tourism has been encouraged but left to develop in a largely organic and disorderly manner, Vietnam has, for some time now, emphasized a more structured planning approach to the tourism sector. Master plans have been regularly developed at both the national level (the most recent one in 2012 for the 2013-2017 period) and for specific provinces, municipalities, and their encompassing tourist zones, including, where relevant, trans-jurisdictional tourism zones such as the Mekong Delta. In the last 2 years alone, 9 such plans have been developed and approved (1 regional and 8 tourist zones) (VNAT, 2017).

Through the spatial regression model, it can be seen that the spatial spillover effect of Vietnam's economic growth is not strong, and the economic development of one area does not significantly affect the level of economic development of neighboring areas; however, the influence of the



tourism industry on local economic growth is enormous. Clearly there is room for improvement since in the global economy, tourism is still one of the most noticeable and growing sectors. This sector can still play an important role in advancing Vietnam's economy. An increase in tourism flow can certainly result in positive economic outcomes to Vietnam. This is key when gross domestic product (GDP) and employment opportunities increase (World Bank, 2018; World Bank (2019)). The findings suggest that Vietnamese economy could enhance its economic growth by purposefully strengthening the tourism industry (ITDR, 2017; UNWTO, 2018).

### Limitations and future research directions

Although the research has pointed out the impact of the tourism industry on Vietnam's economic growth, there are many reasons for economic growth such as capital, labor resources, technical advances, etc. Therefore, in the future, the research team will add factors affecting economic growth to the model in order to comprehensively assess the level of influence of these factors on Vietnam's economic growth.

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