CASE STUDY OF THE RELATIONSHIP BETWEEN SOCIO-ECONOMIC EQUALITY AND SPATIAL DISTRIBUTION OF TOURIST SITES IN TAIWAN: AN APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS

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Abstract: Several authors have already addressed the issues of environmental justice and spatial distribution of destination sites; however, few have combined the two to explore possible geographic inequities in tourism development. The purpose of this study was to examine whether benefits from tourism development were equally distributed across geographic regions and socio-demographic groups in Taiwan. The results indicated that there is spatial inequality in the distribution of number of tourists with regards to average household income with a concentration of tourism numbers on peripheral areas with lower incomes; however, no spatial inequality was observed with respect to size of population and average personal traveling expenses. The findings also indicated that the data were geographically clustered and that consequently spatial regression was a preferable method in comparison with traditional OLS regression. Based on these findings destination managers and tourism planners are recommended to consider the impacts of tourism on local communities as tourism is predominant in peripheral areas in need of revitalization.

Introduction

The relationship between spatial distribution of tourist sites and socio-economic equality is of interest to tourism researchers because in 1994, President Clinton emitted an executive order asking all federal land management agencies to address the issue of environmental justice. This presidential initiative was the initial stimulus to examining whether or not national outdoor recreational sites represented local undesirable land use (LULU) (Porter & Tarrant, 2001). According to Porter and Tarrant (2001), the issue of whether tourist sites may represent locally desirable land use (LDLU) to local people needs to be further explored. In fact, most authors accept that tourism development typical brings positive and negative impacts to the region. On one hand, tourism may cause desirable land use because of its economic benefits and job opportunities for local residents (Holden, 2000; Slee, Farr, & Snowdon, 1997; O'Hare & Barrett, 1999). On the other hand, tourism may actually cause undesirable land use due to environmental and socio-cultural impacts such as increased crime and prostitution, cultural degradation, increased traffic and crowding (Tarrant & Cordell, 1999; Wahab, 1996; Wyllie, 2000).

A question central to the debate of spatial equity in tourism is whether or not tourism sites are distributed equally among areas with varying socio-economic characteristics. Most authors argue that, in fact, tourism is typically concentrated in the pleasure periphery (Turner and Ash, 1975) - regions with lower socio-economic status away from developed centers of production and consumption (Brown & Hall, 2000). This concentration of tourism development in less-favored areas has led authors to stress the need to look into how tourism is helping or hurting the host regions. Walford (2001), for example argued that "the policy context in tourism has been adjusted with a shift of emphasis from the dominant post-war tenets of expansion and modernization to diversification, environmental protection and extensification" (p. 332). That is, environmental, social, cultural, and market factors must be simultaneously considered in tourism planning (Formica & Uysal, 1996). Similarly, Slee et al. (1997) proposed that any definition of tourism might be insufficient if it does not consider the impacts of tourism on the economic, socio-cultural and bio-physical environments.

Most research dealing with the unbalanced spatial distribution of tourism development has been conducted at the international tourism level, typically looking at the flow of tourists from western developed countries to southern developing countries (Backman & Morais, 2001). Few studies have looked at the spatial distribution of tourism development at the national level even though in most countries domestic tourism is usually as important as, or more important than, international tourism. One important study examining spatial distribution of tourism was conducted by Porter and Tarrant (2001). These authors found that census units with low household income, and predominant blue-collar occupations were more likely to live near a tourist site. Moreover, Nicholls and Shafer (2001) supported that the distribution of neighborhood parks in urban areas was equitable in regards to the age groups of interest, but inequitable with respect to income. In addition, Tarrant and Cordell (1999) documented that average household income might be utilized to predict the proximity of outdoor recreation sites. According to their results, the census block groups (CBGs) with a higher proportion of lower income households were significantly more likely to be situated within 1,500 meters of a wilderness area, campground, and/or good fisheries habitat than CBGs with higher income.

In sum, although many authors have argued that tourism usually entails the movement of people from developed areas to peripheral areas with lower socio economic status, there is little empirical evidence that this is true. This lacuna in the literature is particularly important because it lays at the basis of the popular sustainable development movement - tourism must not be a tool to further exploit developing regions. Therefore, the purpose of this study was to examine whether benefits from tourism development were equally distributed across geographic regions and socio-demographic groups in Taiwan. The analysis presented in this paper is of an exploratory nature. The following research questions guided the study.

1. What is the spatial distribution of tourism in Taiwan (number of tourists per site)?

2. Are socio-economic characteristics (size of population, average household income, and average personal traveling expenses) of the census bloc group's predictors of the level of tourism development in that region?

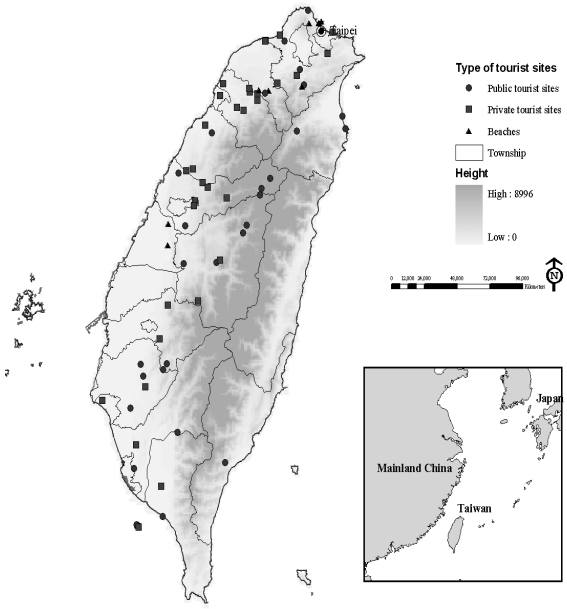

Figure 1. The distribution of three types of tourist sites in Taiwan

Methods

Secondary data about location and tourist sites were gathered from the Taiwan Tourism Bureau (Taiwan Tourism Bureau, 2000). In this study three types of tourist sites were considered (i.e., public tourist sites, theme parks, and beaches) from a total of 72 tourist sites (see Figure 1). Other types of tourist sites were not included in this study because time-series tourist data was not available. Three socio-economic variables reported in 1997 were tested: the size of population, the average household income measured in Taiwan dollars per household, and the average household traveling expenses. These socio-economic data were retrieved from the Taiwan Census Bureau (2002), and were then grouped in CBGs and geographically associated to their respective tourist sites. A total of 21 out of 23 CBGs within the main Taiwan Island were selected.

Using ArcView software, version 3.3 (Environmental Systems Research Institute, 2001), the digitizing CBGs and tourist site maps were created and stored as a shape file. All CBGs were represented as a polygon with attribute of three socio-economic variables. Tourist sites were

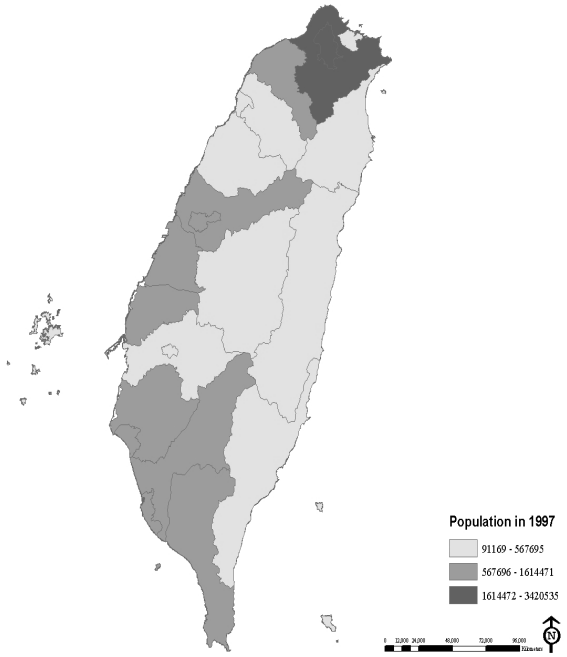

Figure 2. The distribution of population in each CBG

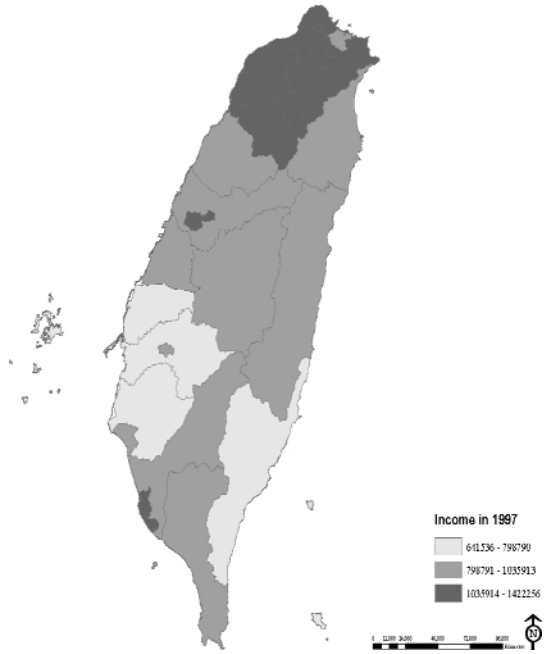

Figure 3. The distribution of household income in each CBG

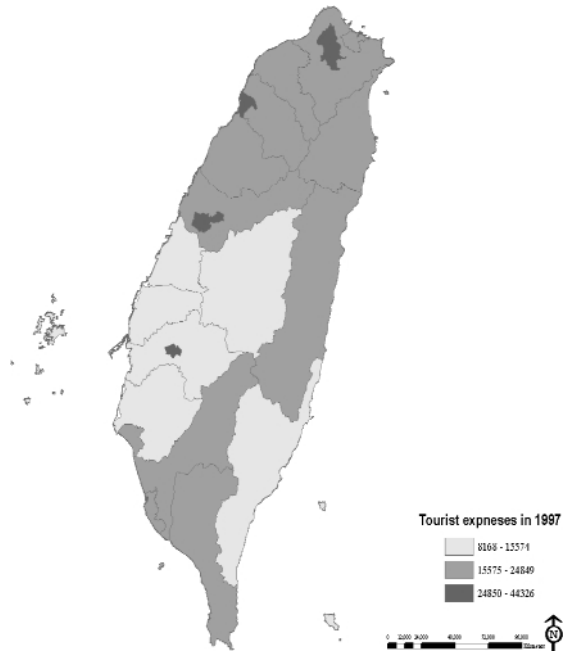

Figure 4. The distribution of average traveling expense

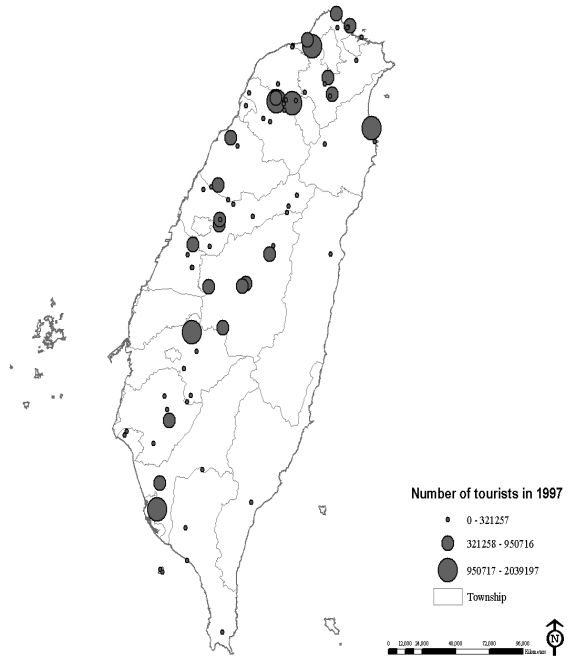

Figure 5. The distribution of number of tourist sites

represented as a point shape file with attribute information of location (x, y coordinate pair) and number of tourists.

Further, a distance analysis was performed to calculate the real distance between each pair of tourist site and CBG. According to Walmsley and Jenkins (1992), the influence of distance on tourists' behavior may be a constraint on destination choices. In addition, in previous research the "friction of distance" in the gravity model was found as a central component of

Table 1. — Moran I based on first order spatial neighbors

Variable	Correlation	Variance	Std. Error	Normal Statistics	Normal p-value	Permutation p-value
Population.1436	.01985	.1409	1.358	.1746	.067	
Income .3465	.01985	.1409	2.797	.0052*	.004	
Traveling expense	.1592	.01985	.1409	1.468	.1421	.006
Number of tourists	.1399	.01985	.1409	1.331	.1832	.071

* Significant at .05 level

Table 2. — Geary based on first order spatial neighbors

Variable	Correlation	Variance	Std. Error	Normal Statistics	Normal p-value	Permutation p-value
Population.7596	.04977	.2231	-1.078	.2813	.263	
Income .3725	.04977	.2231	-2.813	.0049*	.000	
Traveling expense	.4637	.04977	.2231	-2.404	.0162*	.006
Number of tourists	.7904	.04977	.2231	-.9394	.3475	.297

* Significant at .05 level

Table 3. — The comparison of statistics values of SAR and MA model

			Moran's I		
Spatial Regression Model	Log-likelihood value	Rho value	Normal statistics	Normal p-value	Permutation
SAR	-312.9	.08290	.2819	.7888	.361
MA	-312.9	.09639	.2598	.2598	.368

Table 4. — Socio-economic Predictors of Number of Tourists in all tourist sites

	Linear Regression Model		Spatial Regression Model			
			SAR Model		MA Model	
Variable	t-value	p-value	t-value	p-value	t-value	p-value
Population	-.7070	.4886	-.7369	.4712	-.6714	.5110
Average of household income	-1.4166	.1737	-2.2426	.0417*	-2.4447	.0348*
Traveling expense	.6628	.5159	.1813	.8582	.1637	.8719

* Significant at .05 level

modeling tourism demand (Kim & Fesenmaier, 1990). In this study, total number of tourists for each CBG came from cumulated number of tourists of 72 tourist sites, which calculated the proportional distance of each pair of tourist site and CBG. Finally, number of tourist data and socio-economic data in each CBGs were then exported through the interface of S-PLUS for ArcView GIS (Insightful Corporation, 1998) in order to be analyzed in S+SpatialStats as object files (Kaluzny, Vega, Cardoso, & Shelly, 1997).

According to Tobler's First Law of Geography, "everything is related to everything else, but near things are more related than distant things" (Tobler, 1970, p. 236). In this study, this effect was regarded as spatial autocorrelation (Scott & Lloyd, 1997). Therefore, the neglect of spatial autocorrelation among geographical units might mislead the importance of the variables or the correlations among different variables (Bailey & Gatrell, 1995). The data contained in each CBGs were analyzed using the OSL regression model and spatial regression model in S-Plus software with SpatialStats module to explore linear relationship of one dependent variable (i.e., number of tourists), and three independent variables (size of population, average of household income, and

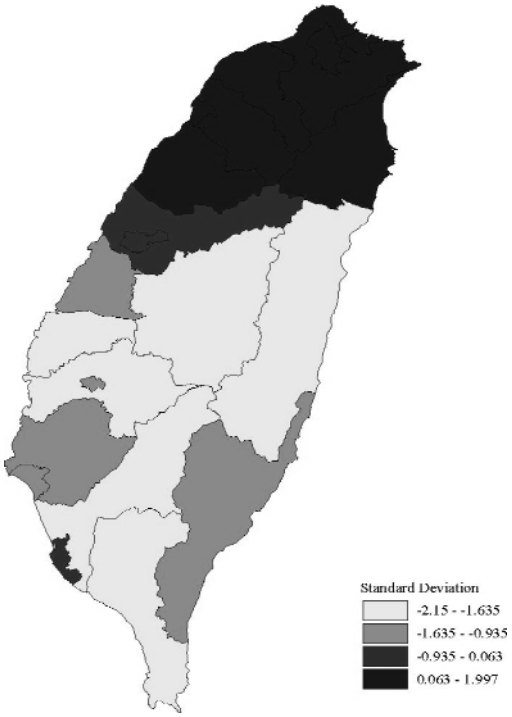

Figure 6. The autocorrelation of average household income

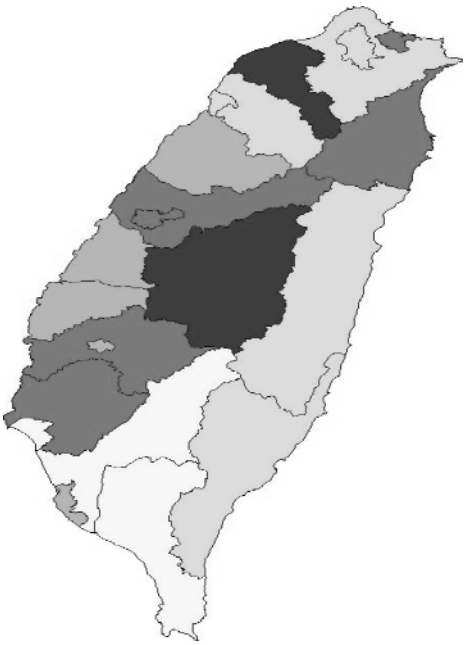

Figure 7. The distribution of residuals for OLS regression

traveling expense) in all CBGs. In total, three regression analysis (i.e., one OSL regression and two spatial regressions) were conducted.

Results

The distributions of population, household income, and traveling expense in each CBG were displayed in Figure 2, Figure 3, Figure 4 and Figure 5. As can be seen in Figure 2, highly populated areas are situated in northern urban areas and less populated areas are located in eastern rural areas. The higher average household income and traveling expense across the 23 CBGs was in north, middle, and south urban areas. Lower household incomes were found in south-middle and north-east rural areas (see Figure 3 and Figure 4). The highest numbers of tourists were found on the western region, and the least concentration of tourists were found in the east (see Figure 5).

OLS regression model

The measurement of spatial autocorrelation analysis (i.e., Moran I and Geary statistics) indicated that household income and traveling expenses might have higher spatial autocorrelation than other variables (see Table 1 and Table 2). As

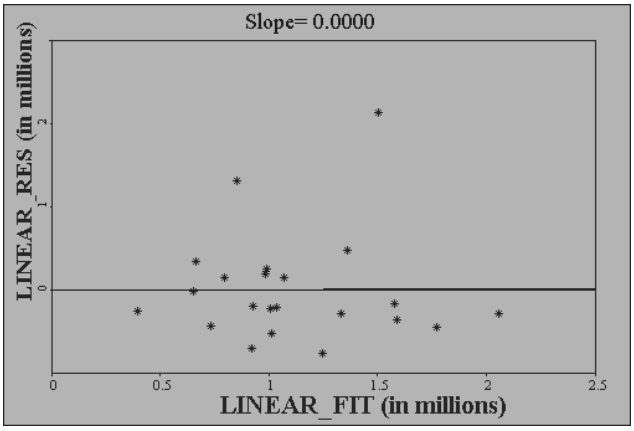

Figure 8. The scatterplot of residuals vs. fitted values for OLS regression

can be seen in Figure 6, higher average household incomes were clustered in northern urban areas. Furthermore, the analysis of the residuals obtained from the outcome of OLS regression model identified some spatial autocorrelation (see Figure 7). This result may invalidate the assumption of OLS regression that there is only first order (linear) variation. Moreover, the scatterplot of residuals vs. fitted values also indicated that there was no

constant variance in OLS regression (see Figure 8). Overall, we could not conclude that there was a statistically significant linear relationship of size of population, average household income, and traveling expense to number of tourists (see Table 4).

Spatial regression model

In both Simultaneous Autoregressive Models (SAR) and Moving Average Model (MA), the results indicated these two regression models were appropriate for the data (rho = .083 in SAR model, and rho = .096 in MA model) (see Table 1). And, the residuals of two regressions based on the Moran's I test indicated that there was no autocorrelation in these two models. Further, of three independent variables examined, the results indicated that only average household income was significantly negative related to number of tourists (see Table 2). This was consistent with previous research stating that the present location of tourist sites might be disadvantageous to people who were high household income (Nicholls & Shafer, 2001; Porter & Tarrant, 2001; Tarrant & Cordell, 1999). For example, people who lived in Taipei city might have less tourist sites than people lived in rural areas. That is, the spatial distribution of tourist sites was unequally distributed within CBGs with varying average household incomes.

Discussion and Implications

Is the issue of a relationship between socio-economic equality and the spatial distribution of tourist sites significant? The overall results indicated that there was a spatial inequality in the distribution of the number of tourists with regards to average household income; however, no spatial inequality was observed with regards to size of population or average of traveling expense. The findings indicated that CBGs with lower household income were likely to have greater number of tourists than CBGs with higher household income. This was consistent with previous research indicating that average household income might be a better predictor of environmental justice than other socio-cultural variables (Nicholls and Shafer, 2001; Porter & Tarrant, 2001; Tarrant & Cordell, 1999).

Finding that there is spatial inequality in Taiwan with respect to tourism development accentuates the importance of considering sustainability principles when planning tourism development. While a conversion of spatial inequality based on tourism benefits occurs, tourism management may react to the policy guidelines including environmentally, economically, and socially sustainable goals. From the perspective of local residents, the spatial proximity of recreation opportunity spectrum may increase the attraction of the area and lead to more money and time spending for these destinations (Ashworth & Dietvorst, 1995; Clark & Stankey, 1979). Local residents should not refer to tourism revenues as a gift because they should continuously reinvest some economic revenues in the maintenance and improvement of the region in the attempt to turn tourism into a desirable land use.

In regards to the methodology of spatial analysis, we would argue that the utilization of spatial regression is more appropriate than traditional OLS regression when the data may be associated with geographic locations. In this study, for example, the findings were different when using spatial and linear analysis. Since the data were found to be spatially clustered, we concluded that the former were more accurate.

According to Driver, Brown and Peterson (1991), Tarrant and Cordell (1999), destination managers and tourism planners should recognize who and where benefits from tourism. Since people in lower income areas are more likely to receive tourists than people in higher income areas, it is important to assure that tourism is brining relief to their lower socio-economic conditions. For example, non-local tourism businesses might need to pay higher taxes, or a higher percentage of tourism tax should be used for local development. In addition, since most tourists come from urban areas to visit rural destinations, tourism policies should promote a balanced and sustainable tourism development to help rural people increase their socio-economic standings or provide an incentive of establishing tourism facilities. As Holden (2000) suggested, "policy and planning need to reflect a balanced approach to how resources are used and include local communities in the development process" (p. 203), the tourism benefits brought by the development and allocation of resources should be evenly distributed for each group. Finally, this study reinforces the potential of using GIS as a tool to measure the socio-economic equality in the context of tourism. Owing to its powerful ability

to capture, store, and manipulate spatial data and aspatial data, the detailed databases of type of tourism resources (e.g., the heritage tourism, nature-based tourism, etc.) and tourist characteristics (e.g., the socio-demographics, past tourism experience, etc.) may help tourism managers to better develop balanced policies of tourism development.

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