International Journal of Economics and Finance; Vol. 7, No. 9; 2015
ISSN 1916-971X E-ISSN 1916-9728
Published by Canadian Center of Science and Education

Is Tourism the Optimal Public Investment to a Small Economy? A Case of Xiao-Liu-Qiu, Taiwan

Wei-Lin Chen[1]

[1] Graduate School of International Development, Nagoya University, Japan

Correspondence: Wei-Lin Chen, Graduate School of International Development, Nagoya University, Japan. E-mail: g9535007@gmail.com

Received: June 27, 2015 Accepted: August 10, 2015 Online Published: August 25, 2015

doi:10.5539/ijef.v7n9p136 URL: http://dx.doi.org/10.5539/ijef.v7n9p136

Abstract

Xiao-liu-qiu is one of the offshore islands of Taiwan, it has been promoted as a tourism destination and has attracted more and more tourists since last decade. The aim of this paper is to identify the key industries in the economy of Xiao-liu-qiu, within the context of tourism as a development strategy. To that end, the study utilized the bi-regional input-output analysis to answer the following questions: (1) what are the inter-industry relationship in the economy of Xiao-liu-qiu; (2) how are the economic effects in terms of output, employment, and wage in Xiao-liu-qiu; and (3) whether the economy structure and the multiplier effects had a change during the period 2006-2011 in Xiao-liu-qiu. Indices of economic structure, multipliers, and industry linkages were employed to estimate the importance of each industry, both individually and holistically. In sum, the results show that the economy structure did not have a significant change during the time. The fishery was still a vital industry in the whole economy, but the importance had a slight decrease over the past few years. Tourism characteristic industries were boosting during the period. However, not all of these industries could generate the relatively bigger multiplier effects in terms of output, employment, and wage. Transportation industry played a significant role in the economy when the tourism demand was growing. Both administrative and further research recommendations are given based on the findings.

Keywords: input-output analysis, regional study, key industry, multiple economic indicators

1. Introduction

1.1 Background

Tourism is a composed economic entity with high indirect pulling effect on other industries (Soulie & Valle, 2014), and it has been regarded as a driver of fostering economic growth (Vellas, 2011). The most important reason to develop an area as a tourism destination is to increase the extra economic benefit, especially in the regional economy (Baaijens, Nijkamp, & Montfort, 1997). Therefore, it is vital to assess the industry interrelationship and the economic impact of tourism in order to provide a comprehensive basis for policy making. In general, two principal measures have been applied to identify key industries in a particular economy. One is the linkage indices approach, and the other is the multiplier method (Kay, Pratt, & Warner, 2007; Kweka, Morrissey, & Blake, 2001). In the tourism field, previous studies have proved that the methods are useful to estimate the economic impact, both at national level (Croes, 2007; Khanal, Gan, & Becken, 2014; Mazumder, Ahmed, & Al-Amin, 2009; Oosterhaven & Fan, 2006) and regional level (Giannakis, 2014; Haddad, Silva, Porsse, & Dentinho, 2012).

The Taiwanese government also noticed that tourism development has the potential to stimulate economy boom on island regions. Therefore, the public spending has been invested to extend the infrastructure and to promote the tourism development. Xiao-liu-qiu is one of the offshore islands that received extra-budgetary fund from the Taiwanese government for local development. The island is located in the west southern area of Taiwan with 6.8 km^2 in total territorial area and is administered by Pingtung County (see Figure 1). It is the only coral island out of the 14 offshore islands of Taiwan. The shortest distance between Taiwan and Xiao-liu-qiu is 14 km, and it takes about 30 minutes for visiting this island by ferryboat. The island attracts a greater number of tourists year by year because of its attributes such as coral formations, abundant natural tourism resources, and easy-going culture. According to the data of PTCG (2014) and DBNSA (2014), Xiao-liu-qiu, with 12,415 registered

inhabitants, attracted 378,791 visitors in 2013. Emerging businesses started to appear gradually for providing tourism services to visitors since 2000.

1.2 Research Statement, Objective and Questions

Recently, the government policy and investment have been supporting the tourism development in Xiao-liu-qiu. However, an empirical investigation for this issue is not yet available to explore whether tourism plays an important role for local economic growth. The aim of this paper is to define the key industries in the economy of Xiao-liu-qiu within the context of tourism as a development strategy. To that end, the study utilized input-output analysis to answer the following questions: (1) what are the inter-industry relationship in the economy of Xiao-liu-qiu; (2) how are the economic effects in terms of output, employment, and wage in Xiao-liu-qiu; and (3) whether the economy structure and the multiplier effects had a change during the period of 2006-2011 in Xiao-liu-qiu. The remaining framework of the paper is as follows: part two presents the tourism development and the government investment in Xiao-liu-qiu; part three describes the methodology; part four explains the results and discussion; and the last part presents the conclusions and implications.

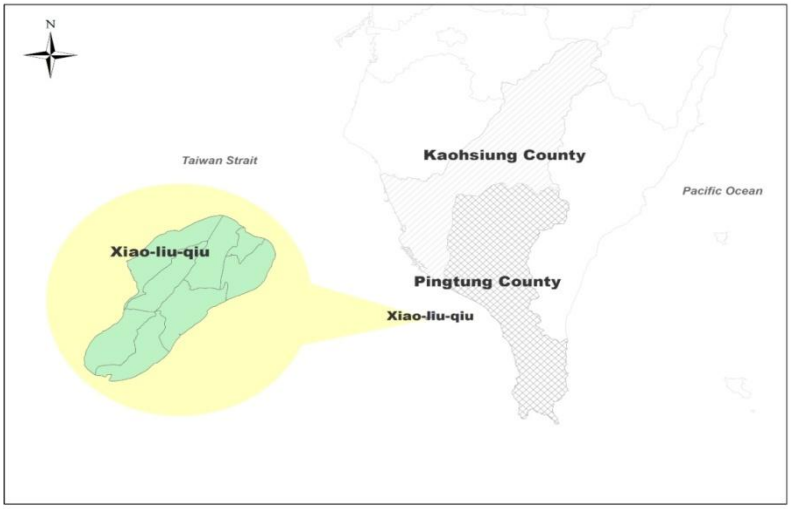

Figure 1. The location of Xiao-liu-qiu

Source: author.

2. Tourism Development and the Government Investment

It is well-known that tourism as an "export-based" industries play a significant role in a local economy because it can bring new money into the community (Hearn & Tanner, 2009). Tourism has been promoted by the Taiwanese government and the inhabitants to improve economy development and to generate additional household income. Offshore islands in Taiwan are low developed in the context of national development. Therefore, the Taiwanese government set up the "Offshore Island Development Fund" standing on the "Offshore Island Development Act" in 2001. The main purpose of the Act and the Fund are "to promote the construction of offshore island, to integrate the industry development, to maintain the environmental resource, to preserve the cultural characteristics, and to improve the offshore inhabitant's benefit and quality of life" (Article 1) (NDC, 2000). Offshore Island Development Fund was implemented on six offshore islands, investing in seven items, including "transportation and tourism development", "agriculture development & ecology conservation", "water resource & local industry development", "education & manpower training", "culture preservation & development", "medical development", and "environmental protection". Xiao-liu-qiu is one of the islands that received extra-budgetary fund under the "Offshore Island Development Act". Figure 2 shows the Offshore Island Development Fund spent in Xiao-liu-qiu and the tourist numbers during the time of 2006-2013. The amount of Fund was not the same depended on the projects by year. But, it is clear to notice that the big percentage of Fund contributed to the item of "transportation & tourism development", except in 2010. It shows that the government highly supported tourism and transportation development while the tourist numbers were increasing year by year.

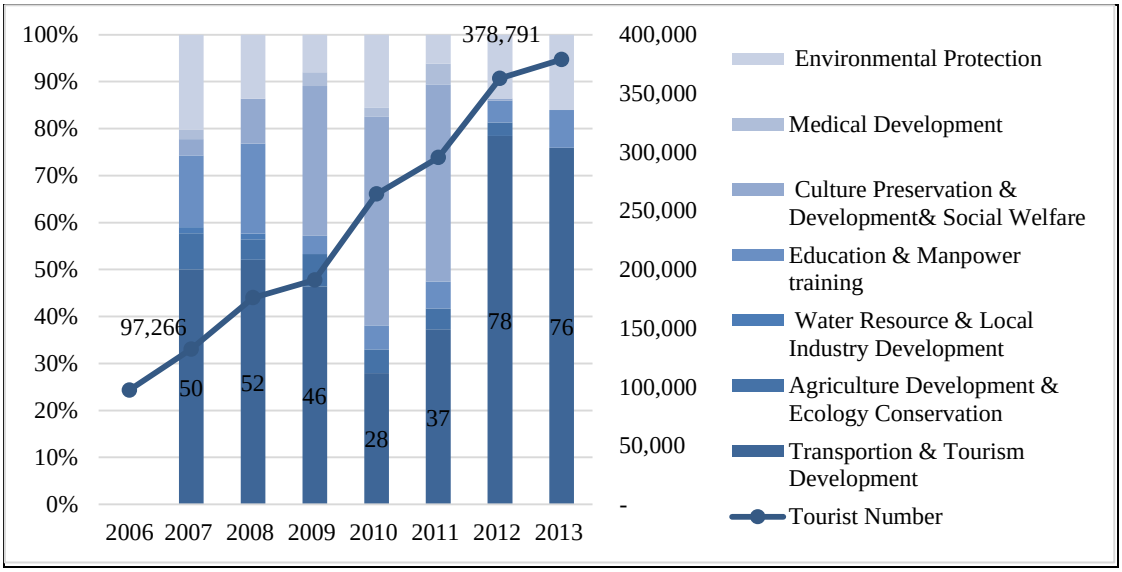

Figure 2. Government investment and tourist numbers in Xiao-liu-qiu, 2006-2013 (Unit: percentage; person)

Note. The data of government investment in 2006 is not available.

Source: author drew based on the data of DBNSA (2014) and ODC (2007, 2008, 2009, 2010, 2011, 2012, 2013).

3. Method

3.1 Data and Industry Categorization

The study employed the open input-output model; disregarding the induced effects of household earning and consumption. Following two basic assumptions of the input output model, "homogeneous" and "proportions", the bi-regional input-output tables for the year of 2006 and 2011 were constructed. The data used in this study included, (1) national benchmark input output tables for 2006, 2011 (DGBAS, 2009, 2014); (2) industry, commerce and service census for 2006, 2011 (DGBAS, 2008, 2013); (3) agriculture, forestry, fishery and animal husbandry census for 2005, 2010 (DGBAS, 2007, 2012); and (4) Pingtung County statistical yearbook for 2006, 2011 (PTCG, 2007, 2012). Xiao-liu-qiu is administered by the Liu-qiu Township of Pingtung County. Therefore, the statistical data were collected from the Pingtung County statistical yearbook.

Table 1 shows industry category used in this study. The name of each industry is given based on the standard industrial classification system of the Republic of China published by DGBAS (2011). The economy in Xiao-liu-qiu is much simpler than Taiwan as a whole and highly relies on the importation from the mainland. Therefore, it is necessary to take both of them as a system. Besides, only 11 out of 14 industries appear in Xiao-liu-qiu. "Electricity & Gas Supply (S4)", "Water Supply (S5)", and "Remediation Services (S6)" are not existing on the island. The services of energy supply (e.g. electricity, gas) and waste treatment (e.g. solid garbage) are provided by the Taiwanese mainland. However, the importance of energy supply and waste treatment cannot be ignored because tourism activities depend heavily on them. Therefore, 14 industries are remained and utilized in the following analysis. Tourism characteristic industries identified in this study including "Wholesale & Retail Trade (S8)", "Transportation and Storage (S9)", "Accommodation (S10)", "Food Service (S11)", "Support Services (S13)" and "Entertainment & Recreation (S14)". The categorized basis of tourism characteristic industry are listed as follows: First, the standard of categorization is referred to the category of Taiwan Tourism Satellite Account and OECD glossary. Second, the products of these industries were mainly sold to tourists. Third, by citing the concept of Okubo and Planting (1998), the revenues of industries would be affected dramatically if tourism characteristic industries were not present.

Table 1. Industry category and description in Xiao-liu-qiu

Category	Subcategory (code)	Description
Agricultural	Agriculture, Forestry, and Animal Husbandry (S1)	Growing of Cereals (Except Rice), Growing of Vegetables, and Growing, of Fruits
	Fishing (S2)	Marine Fishing, Marine Aquaculture
Manufacturing	Mining & Quarrying and Manufacturing (S3)	Manufacture of Fish, Crustaceans and Molluscs Products
Services	Electricity & Gas Supply (S4)	N/A
	Water Supply (S5)	N/A
	Remediation Services (S6)	N/A
	Construction (S7)	Construction
	Wholesale & Retail Trade* (S8)	Retail Trade (including souvenir sales to the tourists)
	Transportation and Storage* (S9)	Water Transportation (mainly passenger ferry from mainland of Taiwan to Xiao-liu-qiu) and Postal Activities
	Accommodation*(S10)	Short Term Accommodation Activities
	Food Service* (S11)	Food and Beverage Service Activities
	Other Services (S12)	Information and Communication; Financial and Insurance Activities; Professional, Scientific and Technical Activities; Human Health and Social Work Activities; and Other Personal Service Activities
	Support Services* (S13)	Rental and Leasing Activities, mainly motorcycle renting to tourists (primary transportation tool on the island)
	Entertainment & Recreation* (S14)	Amusement and Recreation Activities (providing water recreation activities and operating equipment renting services to tourists, e.g. snorkeling, scuba diving, banana boating)

Note. * Denotes tourism characteristic industry.

3.2 The Basis of Input-Output Analysis

Since 1981, input-output tables were only constructed at nation levels in Taiwan. Therefore, the regional industry statistics in given year were used to estimate input-output coefficients based on the national input-output tables for 2006 and 2011. The methods of location quotients (LQ) and RAS procedure (a "bi-proportional" matrix balancing method) were utilized to estimate the inter-regional transaction flow and to balance the bi-regional input output table in this study. In algebra, the standard input-output model is written as equation (1). Following the well-established matrix notation, the bold uppercase letters show matrices, and the bold lowercase letters denote vectors.

$$x_i = \sum z_{ij} + f \tag{1}$$

Where x denotes the output of a given industry; Z denotes the intermediate transaction flow, and f denotes the final demand of a given industry. Each column of the industry represents the inputs required for that industry to generate its total output, and it can be calculated by dividing all column elements in a specific industry by the total production value of that industry. Following this rule, a new matrix A named as input coefficients (technical coefficients) would be obtained. The matrix represents that the relationship of input values from other industries are required by a specific industry to produce one unit of its output.

$$A = Z\hat{x}^{-1} \tag{2}$$

$$Z = Ax$$

Then, substituting equation (2) into (1):

$$x = Ax + f \tag{3}$$

$$x - Ax = f$$

$$(I - A)x = f$$

$$x = (I - A)^{-1}f \tag{4}$$

$$x = Lf$$

Where $(I - A)^{-1}$ is Leontief inverse matrix L (also called the multiplier matrix or total requirement matrix) (Miller & Blair, 2009). It is the core element in the input-output model, and it describes the relationship between final demand and total production value (output). In other words, the matrix shows when one unit of final

demand changes, how much unit of total production would be affected.

3.3 Estimation Procedure

A bi-regional input output table follows the same structure of a standard input output table but decomposes every industry into two in terms of the geographic areas. Therefore, each industry appears twice in the table: the industries located within the focus region; and the industries located outside of the region. Considering equation (1) and (3) into a bi-regional setting, including region s and region r. So that, the bi-regional input output table can be divided into several sub-matrices and sub-vectors. Location quotients (LQ) is a way for estimating trade coefficients (Tohmo, 2004). The simple location quotients (LQ) is defined as equation (5) and used to obtain both intra-regional technical coefficients and inter-regional import coefficients. Both regional technical coefficients and the import coefficients depict trade patterns between and with the regions (Miller & Blair, 2009). In regional studies, LQ can be used to explore the concentrated industries of region r and the outside of the region (region s).

$$LQ_i^r = \left(\frac{x_i^r / x^r}{x_i^n / x^n}\right) \tag{5}$$

Where x_i^r denotes the total production value of industry i in region r; and x^r is the total production value of all industries in region r. x_i^n and x^n are data at national level. Similarly, data at region s were also used to measure industry concentration level. If the industry with $\mathrm{LQ}_i^r > 1$, it indicates that industry i has more concentrated development in region r than in the entire nation, and that it can satisfy the demands of other regions. In other words, the regional economy has a comparative advantage in those industries. By contrast, when the industry with $\mathrm{LQ}_i^r < 1$, it means that industry i is not concentrated on region r than in the nation, therefore, it is not sufficient to drive the economy. These LQ coefficients are calculated to estimate input-output coefficient from the national level to the regional level. Combining the concepts of LQ and a bi-regional input output table setting together, if industry i has more concentrated development in region r than in the nation ($\mathrm{LQ}_i^r > 1$), it is assumed that the national input coefficient (a_{ij}^n) is used as the regional input coefficient (a_{ij}^{rr}), no adjustment is made for that industry. On the contrary, the industry with $\mathrm{LQ}_i^r < 1$, its regional direct input coefficients (a_{ij}^{rr}) has to be reduced and is estimated from the national coefficient (a_{ij}^n) and multiplied by LQ_i^r. The intra-regional input coefficients and inter-regional import coefficients are estimated based on the equations (6) and (7), respectively.

$$a_{ij}^{rr} = \begin{cases} (LQ_i^r) a_{ij}^n, & if\ LQ_i^r < 1 \\ a_{ij}^n, & if\ LQ_i^r \geq 1 \end{cases} \tag{6}$$

$$a_{ij}^{sr} = \left(1 - \widehat{LQ}_i^r\right) a_{ij}^r = a_{ij}^n - a_{ij}^{rr} \tag{7}$$

Once the inter-intermediate trade matrices representing the transactions of each goods between region s and region r are estimated. The structure of intra-regional input coefficients and inter-regional import coefficients are obtained in this step. Similarly, the final demands of each industry of inter-regions and intra-regions are estimated. Further, a new bi-regional intermediate transaction table can be estimated based on the equation (2). The vector of valued added of each industry in different regions are estimated based on the national census and regional industry statistics. Once the new matrices of the bi-regional intermediate transaction, final demand and the vector of valued added are obtained. The combined matrix has to be adjusted to balance the supply and demand. This procedure is done by an RAS technique. RAS procedure is widely used to update and to regionalize the input output table. Following the criterion in Miller and Blair (2009), when the tolerance error ε, between the estimates and the target values is smaller than 0.001, the new balanced matrix is obtained. Further, Leontief inverse matrix of the bi-regional input output model can be estimated after RAS adjustment.

$$\mathrm{A} = \begin{bmatrix} a_{ij}^{rr} & a_{ij}^{rs} \\ a_{ij}^{sr} & a_{ij}^{ss} \end{bmatrix};\ Z = \begin{bmatrix} z_{ij}^{rr} & z_{ij}^{rs} \\ z_{ij}^{sr} & z_{ij}^{ss} \end{bmatrix};\ F = \begin{bmatrix} f_i^{rr} & f_i^{sr} \\ f_i^{sr} & f_i^{ss} \end{bmatrix};\ v = [v_i^r \quad \dots \quad v_i^s];\ x = \begin{bmatrix} x_i^r \\ \vdots \\ x_i^s \end{bmatrix} \tag{8}$$

3.4 The Basis of Industry Linkages and Multipliers

In the input-output model, there are two types of economic effects in the economy. One is "forward linkage", which is utilized to point out the interconnection of a specific industry with upstream industries from which it consumes inputs; and the other is "backward linkage", which is utilized to point out the interconnection of a specific industry with the downstream industries to which it sells its production (Miller & Blair, 2009). In the inter-regional form of demand-driven input-output model, the Leontief inverse matrix shows that the change in

final demand (F) per industry in a given region are completely met by the change in the total output (x) per industry in a given region, via direct input coefficient (A), determines intermediate demand (Ax), per industry in a given region. Equally, the change in intermediate demand are met by the change in total output. On the other hand, by using the same set of data based on supply-driven model, the Gosh inverse matrix shows the connection of industries total production to the primary inputs, that is to measure per unit of value investing into the inter-industry system at the initial process (Miller & Blair, 2009). In the supply-driven model, instead of dividing the column of Z by the gross output of the industry related to the column, direct output coefficients matrix, denoted as B is suggested dividing each row of Z by the total output of the industry related to that row. Therefore, the equation (4) can be rearranged as,

$$B = \hat{x}^{-1}Z \tag{9}$$

Then,

$$x' = v'G = v'(I - B)^{-1} \tag{10}$$

Where the component v is the vector of value add, and $G = (I - B)^{-1}$ is the Gosh inverse matrix, also is called as the output inverse matrix. Both the Leontief inverse matrix and the Gosh inverse matrix are employed to measure the strength of backward linkage and forward linkage, respectively. The components of the regional the Leontief inverse matrix and the Gosh inverse matrix are showed as equation (11) and then used to describe the importance of inter-industry system at intra-and inter-regions.

$$L = \begin{bmatrix} l_i^{ss} & l_i^{rs} \\ l_i^{sr} & l_i^{rr} \end{bmatrix};\ G = \begin{bmatrix} g_i^{ss} & g_i^{rs} \\ g_i^{sr} & g_i^{rr} \end{bmatrix} \tag{11}$$

The Leontief inverse matrix is the result of a matrix transformation through which multiplier coefficients can be estimated. As L is the Leontief inverse matrix, and G is the Gosh inverse matrix. Further, the simple output, employment, and wage multipliers can be calculated based on equation (12).

$$LBL = \sum_{i=1}^{n} L_{ij}\,; EBL = \sum_{i=1}^{n} E_i\, O_{ij}; WBL = \sum_{i=1}^{n} W_i\, O_{ij} \tag{12}$$

Where LBL: output backward linkage coefficient, and OFL: output forward linkage coefficient; EBL: employment backward linkage coefficient, and EFL: employment forward linkage coefficient; WBL: wage employment backward linkage coefficient, and WFL: wage employment forward linkage coefficient; E_i: matrix of employment technical coefficients (e_{ij}) determined as industrial employment divided by industrial output, W_i: matrix of wage technical coefficients (w_{ij}) determined as wage divided by industrial output.

4. Results and Discussion

4.1 Description of Economic Structure in Xiao-Liu-Qiu

Figure 3 summarizes the industrial contribution to the total production value, value added, employment, and wage. "Fishing (S2)" was the biggest contributor with 60.7% and 53.5% of total production values in 2006 and 2011, respectively. Followed by "Wholesale & Retail Trade (S8)" (10.3%), "Other Services (S12)" (7.5%), and "Transportation and Storage (S9)" (5.3%) in 2006. In 2011, the following sequence were: "Transportation and Storage (S9)" (12.6%), "Construction (S7)" (7.1%), "Wholesale & Retail Trade (S8)" (6.9%), and "Other Services (S12)" (6.2 %). Regarding each industry's contribution to the total value-added, it appears the similar results to the production value. Based on the result, it shows that the significance of fishery industry was relatively decreasing within the entire economy over the period. The reason is that the economic importance of tourism characteristic industries was growing over the year. Especially, the contribution of "Transportation and Storage (S9)" to the total production values and the total value added presented the biggest among tourism characteristic industries. One explanation is that the increase in tourist number stimulated the transportation demand (i.e. ferry transport). In 2006, tourist number stood at 97,266 persons; by 2013, the figure had increased to 378,791 persons (Figure 2). Looking at the magnitude of employment by industry, the top three contributors were "Fishing (S2)", "Agriculture, Forestry, and Animal Husbandry (S1)" "Wholesale & Retail Trade (S8)". Each industry contributed to the whole economy with the shares of 79.6%, 9.6%, and 4.0% in 2006, and the shares of 77.4%, 6.1%, and 5.7% in 2011. The wage significance by industry showed the similar result to the employment as well. The top three contributors were "Fishing (S2)", "Wholesale & Retail Trade (S8)", and "Other Services (S12)". The shares were 50%, 15.9%, and 11.5% in 2006, and 48.7%, 15.2%, and 9.2% in 2011. In sum, the economic importance of fishery was decreasing, and the tourism characteristic industries were increasing gradually. Looking through all tourism characteristic industries, except "Entertainment & Recreation (S14)", the share of employment and wage had grown in 2011, comparing to 2006. It indicates that tourism was more and more significant to the economy of Xiao-liu-qiu in terms of the increase in the contribution of employment and wage.

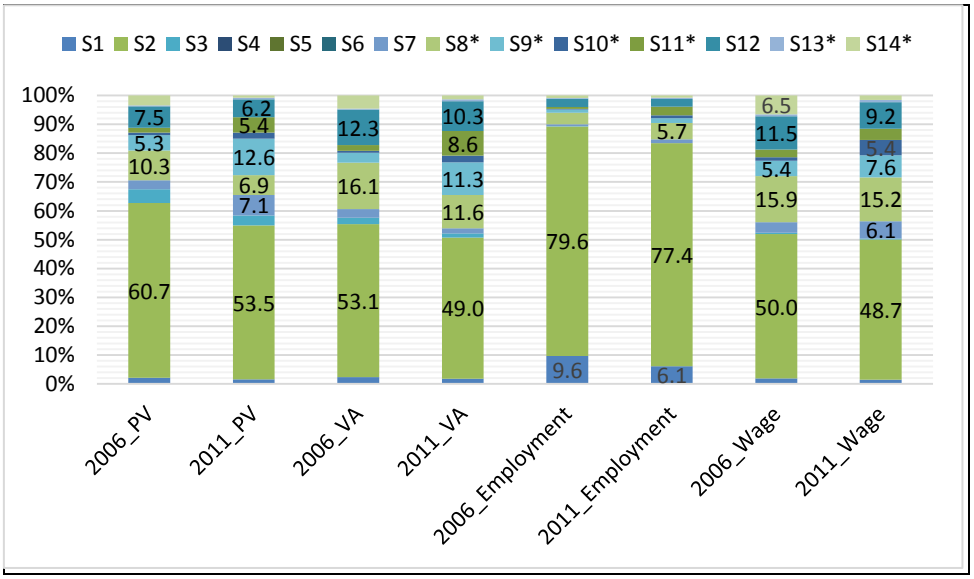

Figure 3. The share of production value, employment, value added, and wage by industry (Unit: %)

Note. * Denotes tourism characteristic industry. Only the share above 5% is numbered. PV—Share of production value; VA—Share of value added; Employment—Share of employment number; Wage—Share of wage. Source: author's calculation.

4.2 Industry Linkage in the Economy of Xiao-Liu-Qiu

Table 2 summarizes the original values of forward and the backward linkage coefficients, and the value added rate by industry. Figure 4 visualizes the position of each industry in the whole economy. The vertical axis denotes the normalized forward linkage, and the horizontal axis denotes the normalized backward linkage. The average of the original values is used for normalization. Therefore, the average of the normalized value is an index of one. The purpose of normalization is to identify the linkage power of these industries across the whole economy and to identify the key industries in the entire economy. The normalized values higher than one represents above-average linkages (strong linkages). It shows that a dollar's worth of production in the particular industry would generate more benefit to the economy than other industries. On the contrary, the normalized values lower than one means below-average linkages (weak linkages). It means that the production in a particular industry produces littler sales to downstream buying industries than in other industries. The circle surface represents the size of value-added rate (%) of a given industry, which refer to the rate of value added to the production value of the industry in the same year multiplied by 100. It indicates the economic contribution by the specific industry to the whole economy. It is worth noticing that the difference appears on the value added rate. Four out six of tourism characteristic industries present bigger value added rate in 2011 than in 2006. They were "Transportation and Storage (S9)", "Accommodation (S10)", "Food Service (S11)", and "Support Services (S13)".

Comparing the values between the years of 2006 and 2011, the overall relationship among these industries did not have significant changes. The industry displays high forward linkage and high backward linkage (both FL and BL >1); it can be classified as a key industry. They are "Agriculture, Forestry, and Animal Husbandry (S1)," "Mining & Quarrying & Manufacturing (S3)," and "Transportation and Storage (S9)". As Kay et al. (2007) suggest that these industries display a potent combination of forward linkage and backward linkage, and they can play an influential role in supporting economic activity within the entire economy. In other words, when the final demand in these industries increases, these industries would stimulate the demand or supply to the other industries because of their stronger linkage powers. The industry with higher forward linkage than the average and a lower backward linkage (FL>1 and BL<1) is named as a forward oriented industry. "Wholesale & Retail Trade (S8)" was the only case. Industry in this group is relatively highly dependent on the demand of inter-industries. It shows that the production of those industries is affected easily by other industries' demand. The industry with both lower forward linkage and backward linkage than the average (FL<1 and BL<1) are relatively independent of other industries. They are "Food Service (S11)", "Other Services (S12)", "Support Services (S13)", and "Entertainment & Recreation (S14). In other words, lower interconnection effect generated in terms of industry's demand or supply. However, "Food Service (S11)" had a slight increase in the backward

linkage in 2011. It was categorized into the group with lower forward linkage and higher backward linkage (FL<1 and BL >1), named as backward linkage industry. Besides "Food Service (S11)", "Fishing (S2)", "Construction (S7)", "Accommodation (S10)" are categorized in this group both in 2006 and 2011. Those industries are relatively dependent on the supplies of other industries. It means that the industries are not affected easily by other industries, but they can play a leading role to improve other industries' production.

Table 2. Backward linkage, forward linkage and value added rate by industry

Year	2006			2011		
Code	FL	BL	VP (%)	FL	BL	VP (%)
S1	2.5	1.2	52.5	1.1	2.7	52.3
S2	3.0	1.1	43.6	1.0	3.2	41.4
S3	3.8	1.3	22.4	1.2	4.2	19.0
S4	-	-	-	-	-	-
S5	-	-	-	-	-	-
S6	-	-	-	-	-	-
S7	2.8	1.1	48.1	1.0	4.4	11.4
S8*	1.5	1.2	78.3	1.1	1.6	76.6
S9*	3.1	1.3	32.7	1.4	3.0	40.4
S10*	2.7	1.1	36.5	1.0	2.6	47.6
S11*	2.3	1.0	59.7	1.0	2.0	71.2
S12	1.4	1.1	82.1	1.1	1.7	75.1
S13*	1.7	1.1	74.4	1.1	1.9	69.7
S14*	1.8	1.0	65.9	1.0	1.8	72.6

Note. * Denotes tourism characteristic industry. FL—Forward linkage coefficient, BL—Backward linkage coefficient, VP—Value added rate.
Source: author's calculation.

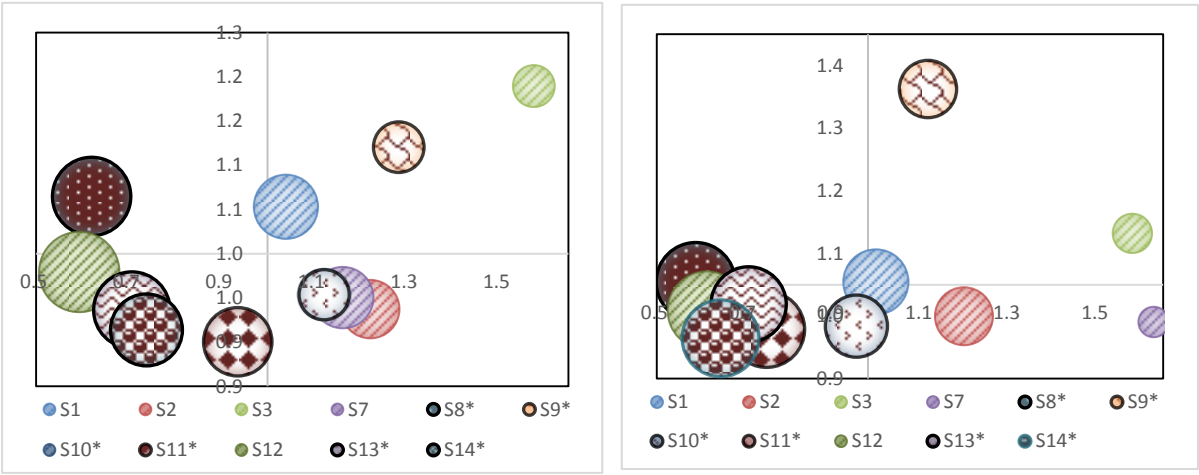

Figure 4. Industry linkage (right: 2006; left: 2011)

Note. * Denotes tourism characteristic industry. Source: author drew based on own calculation.

4.3 Multipliers Effects in the Economy of Xiao-Liu-Qiu

Figure 5 displays the simple output multiplier by industry and its intra-industrial multiplier for 2006 and 2011. The values allow us to find the impact on a particular industry throughout the whole economy due to a dollar increase in final demand for this industry on the island. Five findings are concluded based on the results. First, most of the industry multipliers had slight increases over time. The increases express the stable growth of the entire economy. Second, almost all of intra-industrial multipliers of each industry were consistent over time. Only "Mining & Quarrying and Manufacturing (S3)" was the exception to this rule, it had relative higher increase. The result is not surprising because this industry was the biggest contributor to national GDP in the past years, and as Figure 4 shows, it had strong inter-industry linkages to other industries. Third, "Construction (S7)"

had a comparative increase in a total multiplier, though its intra-industry multiplier did not have corresponding change. The most likely explanation rests on the rise of housing construction in the past years for satisfying lodging demand. Fourth, "Transportation and Storage (S9)" is the top industry among tourism-related industries. This result can be explained that the shipping industry is essential to the whole economic development. It plays the role of mobility such as conveying goods, services, and even people from the mainland of Taiwan to the island. Fifth, only half of tourism-related industries (S9, S10, and S11) had higher multipliers than the average in the years of 2006 and 2011. Adopting the concept by Galloway (2015), output multipliers indicate how "deeply-rooted" an industry is in a given region. Deeply-rooted industry can reproduce the profit through the regional economy during a period before it leaks out to other regions. On the contrary, industries with very small multiplier effects are usually owned by outside of the region. So the profit is lost soon, and it also buys mostly from outside the region. It is called as a shallow-rooted industry. Therefore, these three industries can be regarded as relatively a deeply-rooted industry in the economy of this island.

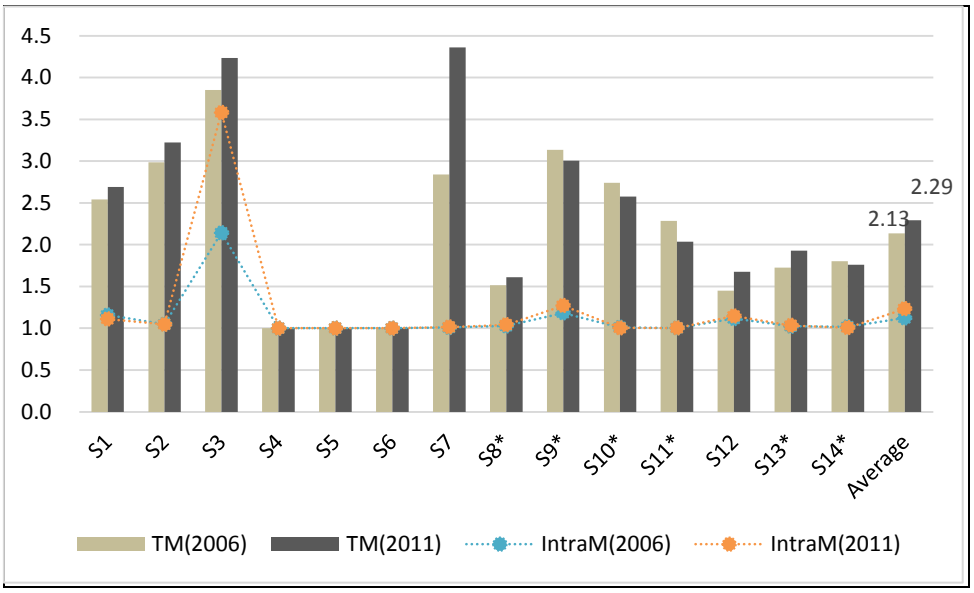

Figure 5. Simple output multipliers by industry and its intra-industrial multiplier

Note. TM (2006)—Total multiplier for 2006; TM (20011)—Total multiplier for 2011; IntraM (2006)— Intra-industrial multiplier for 2006; IntraM (2011)— Intra-industrial multiplier for 2011; * Denotes tourism characteristic industry. Source: author drew based on own calculation.

Simple output multiplier can be utilized further to examine the employment and wage multipliers of each industry. In Table 3, effects on jobs and wages for the year of 2006 and 2011 are listed. The table shows the total change in employment and wages throughout the entire economy from 1 New Taiwan Dollar change in final demand for a given industry. Regarding the employment multiplier, three findings are concluded. First, the top three industries with significant impact on employment in 2006 and 2011 were: "Agriculture, Forestry, and Animal Husbandry (S1)" (EM2006=2.50, EM2011=2.31), "Mining, & Quarrying and Manufacturing (S3)" (EM2006=0.94, EM2011=0.93), and "Fishing (S2)" (EM2006=0.89, EM2011= 0.86). The multiplier values remained consistently over the period. Second, it is worth noting that "Construction (S7)" was ranked from the position of 6th to 4th, with the multipliers of 0.55 for 2006 and 0.78 for 2011, respectively. A possible explanation for the change is that the demand for housing construction for tourism purpose increased rapidly. Therefore, the labor demand for construction had a growth as well. Third, among tourism characteristic industries, "Transportation and Storage (S9)" (EM2006=0.78, EM2011=0.70), and "Food Service S11" (EM2006=0.73, EM2011=0.62) showed higher employment multipliers.

In terms of wage multipliers in the economy of Xiao-liu-qiu, the industry ranking in 2006 and 2011 had a relatively bigger change. First, "Construction (S7)" was ranked as the most significant wage generator in 2011, it was in the position of 5th in 2006 (WM2006=0.29, WM2011=0.44). This industry was indirectly related to tourism development because the rapid expansion of tourism lodging and it had contributed significantly to the

growth of household wages. The largest wage contributor for 2006, "Mining, & Quarrying and Manufacturing (S3)", became the second biggest one, but its multipliers remained consistently in 2006 and 2011 (WM2006=0.42, WM2011=0.40). Second, only "Transportation and Storage (S9)" and "Accommodation (S10)" had relatively higher wage multipliers among tourism-related industries over the period. The position of "Transportation and Storage (S9)" had a slight change from 2nd for 2006 to 3rd for 2011, and the multiplier values (WM2006=0.41, WM2011=0.30) had decreased as well. "Accommodation (S10)" also showed a reduction in the ranking and multiplier, comparing the values for 2006 and 2011.

Table 3. Employment and wage multiplier

Category	Employment				Wage			
Code	EM2006	R	EM2011	R	WM2006	R	WM2011	R
S1	2.50	1	2.31	1	0.26	6	0.24	6
S2	0.89	3	0.86	3	0.31	4	0.29	4
S3	0.94	2	0.93	2	0.42	1	0.40	2
S4	-	-	-		-	-	-	-
S5	-	-	-		-	-	-	-
S6	-	-	-		-	-	-	-
S7	0.55	6	0.78	4	0.29	5	0.44	1
S8*	0.19	10	0.20	10	0.13	10	0.13	11
S9*	0.78	4	0.70	5	0.41	2	0.30	3
S10*	0.55	7	0.49	7	0.34	3	0.27	5
S11*	0.73	5	0.62	6	0.22	7	0.14	8
S12	0.15	11	0.18	11	0.10	11	0.13	10
S13*	0.24	9	0.26	9	0.14	9	0.16	7
S14*	0.28	8	0.27	8	0.19	8	0.14	9
Average	0.71	-	0.69	-	0.26	-	0.24	-

Note. * Denotes tourism characteristic industry. EM2006—Employment multiplier for 2006, EM2011—Employment multiplier for 2011, WM2006—Wage multiplier for 2006, WM2011—Wage multiplier for 2011, R—Ranking. Source: author's calculation.

4.4 Identification of Key Industries within the Economy of Xiao-Liu-Qiu

This study had analyzed the industry importance in the economy during given periods. The indices utilized were: the share of production value, the share of employment, the share of wage, the forward linkage, the backward linkage, value added rate, output multiplier, employment multiplier and wage multiplier. The indices not only allow us to explain the position of industry individually, but also provide a comprehensive picture to identify key industries. In total, eleven industries are existing within Xiao-liu-qiu, the top five industries were determined under each criterion. Table 4 and Table 5 present the identification of key industries by each index for the year of 2006 and 2011. First, the frequency (FQ) of each industry ranked as the top five was computed. The higher frequency of an industry, the more it is likely to be identified as an essential industry. "Transportation and Storage (S9)" and "Fishing (S2)" showed the highest frequency in both periods. Second, the number of each column presented the weighted value in terms of the ranking of each index. Only the top one to the top five were given values from 5 to 1. The industry ranked out of the top five is marked as 0. The mean of each industry was computed and listed in the row of mean (M). The average of the mean was calculated as 1.4. Therefore, the industry with the mean higher than the average was identified as a key industry. In 2006, they were "Fishing (S2)" (M=3.1), "Mining, & Quarrying and Manufacturing (S3)" (M=2.5), "Transportation and Storage (S9)" (M=2.3), "Wholesale & Retail Trade (S8)" (M=2.2), in sequence. In 2011, these four industries remained the essential position with a slight difference in order. It is worth to note that "Construction (S7)" (M=2.1) became one of the key industries in 2011.

Table 4. Identification of key industry in Xiao-liu-qiu for 2006

Index	S1	S2	S3	S4	S5	S6	S7	S8*	S9*	S10*	S11*	S12	S13*	S14*
OP	0	5	1	-	-	-	0	4	2	0	0	3	0	0
VA	0	5	0	-	-	-	0	4	1	0	0	3	0	2
E	4	5	0	-	-	-	0	3	1	0	0	2	0	0
W	0	5	0	-	-	-	0	4	1	0	0	3	0	2
FL	2	0	5	-	-	-	0	3	4	1	0	0	0	0
BL	0	3	5	-	-	-	2	0	4	1	0	0	0	0
VP	0	0	0	-	-	-	0	4	0	0	1	5	3	2
OM	0	3	5	-	-	-	2	0	4	1	0	0	0	0
EM	5	3	4	-	-	-	0	0	2	0	1	0	0	0
WM	0	2	5	-	-	-	1	0	4	3	0	0	0	0
FQ	*3*	*8*	*6*	-	-	-	*3*	*6*	*9*	*4*	*2*	*5*	*1*	*4*
M	*1.1*	*3.1*	*2.5*	-	-	-	*0.5*	*2.2*	*2.3*	*0.6*	*0.2*	*1.6*	*0.3*	*0.6*

Note. OP—Share of production Value, VA—Share of value added, E— Share of employment number, W—Share of wage, FL—Forward linkage, BL—Backward linkage, VP—Value added ratio, OM—Output multiplier, EM—Employment multiplier, WM—Wage multiplier, FQ—Frequency, M—Mean; * Denotes tourism characteristic industry. Source: author's calculation.

Table 5. Identification of key industry in Xiao-liu-qiu for 2011

Index	S1	S2	S3	S4	S5	S6	S7	S8*	S9*	S10*	S11*	S12	S13*	S14*
OP	0	5	0	-	-	-	3	2	4	0	0	1	0	0
VA	0	5	0	-	-	-	0	4	3	0	1	2	0	0
E	4	5	0	-	-	-	0	3	0	0	2	1	0	0
W	0	5	0	-	-	-	1	4	2	0	0	3	0	0
FL	2	0	4	-	-	-	0	3	5	0	0	0	1	0
BL	1	3	4	-	-	-	5	0	2	0	0	0	0	0
VP	0	0	0	-	-	-	0	5	0	0	2	4	1	3
OM	1	3	4	-	-	-	5	0	2	0	0	0	0	0
EM	5	3	4	-	-	-	2	0	1	0	0	0	0	0
WM	0	2	4	-	-	-	5	0	3	1	0	0	0	0
FQ	*5*	*8*	*5*	-	-	-	*6*	*6*	*8*	*1*	*3*	*5*	*2*	*1*
M	*1.3*	*3.1*	*2.0*	-	-	-	*2.1*	*2.1*	*2.2*	*0.1*	*0.5*	*1.1*	*0.2*	*0.3*

Note. OP—Share of production Value, VA—Share of value added, E— Share of employment number, W—Share of wage, FL—Forward linkage, BL—Backward linkage, VP—Value added ratio, OM—Output multiplier, EM—Employment multiplier, WM—Wage multiplier, FQ—Frequency, M—Mean; * Denotes tourism characteristic industry. Source: author's calculation.

5. Conclusions and Implications

The aim of this paper is to identify the key industries in the economy of Xiao-liu-qiu within the context of tourism as a development strategy. Indices of economic structure, multipliers, and linkages of input-output analysis were utilized to estimate the importance of each industry, both individually and holistically.

The fishery industry played a significant role in the economy of Xiao-liu-qiu in terms of its high share of production value, value added, workforce number, and wage. However, the economy structure had a change because of the expansion of tourism development. Tourism attracted not only the government to invest spending on infrastructure, tourism promotion activity, etc., but it also encouraged residents to engage in the tourism business. It had enriched the economy and created the new job opportunities and new income for the locals as well.

The inter-industry relationship almost remained the same structure during the period of 2006-2011. However, it is worth noting that the value added rate had an increase in most of tourism characteristic industries. The economy was growing in terms of the rise in output multiplier over the time. The intra-and inter-industrial

multipliers were at the similar level over the period, only manufacturing showed larger intra-industrial multiplier in 2011 than in 2006. The industry of transportation and storage has the biggest multiplier among tourism characteristic industries. Tourism is a composite product of various industries. The expansion of tourism not only relies on the production within the tourism characteristic industries, but also other industries. As Kweka et al. (2001) mentioned, the industry gains profits from tourism expansion should be taken into consideration because they probably can indirectly improve the growth of tourism impact. Construction was a case in the current study because the demand of tourism facility was increasing in the past years.

Regarding the employment and income multipliers, though the agricultural industry can provide more job opportunities, it does not generate a correspondingly high effect in wages. One possible explanation for the result could be the labor intensity, but low wage level in this industry. Tourism development indeed diversified the economic activities on the island and created jobs and brought new income to the locals. However, as Horváth and Frechtling (1999) and Wall (1997) proposed that the tourism earnings multiplier tends to be lower in a smaller region where earnings leak out of the economy through importing goods and services to satisfy tourism demand. In the case of Xiao-liu-qiu, only accommodation and transportation could generate comparatively higher multipliers in employment and wages, other tourism characteristic industries did not have significant effects.

Since the government budget is always relatively limited in the remote area, this paper determine utilized the multi-rank index to indicate the key industries that may generate the biggest benefits to the entire economy. Based on the results, this study suggests that the government can give priority to the industries like fishery, manufacturing, transportation, retail trade and construction when deciding public investment.

Tourism business is boosting in this island, however, as Polo and Valle (2008) suggested that the local economy should find a way to increase the local production and aware the tourism crisis. Additionally, this study was only able to utilize the data for 2006 and 2011 for analysis due to the limited data accessibility. Tourism has become a primary strategy for enriching local development. Therefore, a long-term analysis is suggested observing the economy of the island and for further policy making.

References

Baaijens, S. R., Nijkamp, P., & Montfort, K. V. (1997). *Explanatory meta-analysis of tourist income multipliers: An application of comparative research to island economies*. Amsterdam, Dutch: Tinbergen Institute.

Croes, R. H. (2007). *The impact of tourism on the economy and population of small islands: The case of Aruba.* (Ph.D Unpublished doctoral dissertation). Utrecht University, Dutch.

DBNSA. (2014). *Tourism statistics. from Dapeng Bay National Scenic Area Administration (DBNSA)*. Retrieved from http://www.dbnsa.gov.tw/gov/Article.aspx?Lang=1&SNo=03002147

DGBAS. (2007). *2005 agriculture, forestry, fishery and animal husbandry census statistical tables*. Taipei City: Directorate-General of Budget, Accounting, and Statistics, (DGBAS), Executive Yun. Retrieved from http://www.dgbas.gov.tw/ct.asp?xItem=18472&ctNode=3279&mp=1

DGBAS. (2008). *2006 industry, commerce and service census statistical tables*. Taipei City: Directorate-General of Budget, Accounting, and Statistics, (DGBAS), Executive Yun. Retrieved from http://www.dgbas.gov.tw/ct.asp?xItem=23387&ctNode=3267&mp=1

DGBAS. (2009). *2006 benchmark I-O table (Intermediate Input 166 sectors)*. Taipei City: Directorate-General of Budget, Accounting, and Statistics, (DGBAS), Executive Yun. Retrieved from http://eng.stat.gov.tw/ct_view.asp?xItem=8488&ctNode=1650

DGBAS. (2011). *Standard industrial classification system of the Republic of China*. Taipei, Taiwan: Directorate-General of Budget, Accounting, and Statistics, (DGBAS), Executive Yun.

DGBAS. (2012). *2010 agriculture, forestry, fishery and animal husbandry census statistical tables*. Taipei City: Directorate-General of Budget, Accounting, and Statistics, (DGBAS), Executive Yun. Retrieved from http://www.dgbas.gov.tw/ct.asp?xItem=32903&ctNode=3279&mp=1

DGBAS. (2013). *2011 industry, commerce and service census statistical tables*. Taipei City: Directorate-General of Budget, Accounting, and Statistics, (DGBAS), Executive Yun. Retrieved from http://www.dgbas.gov.tw/ct.asp?xItem=35336&ctNode=3267&mp=1

DGBAS. (2014). *2011 benchmark I-O table (Intermediate Input 166 sectors)*. Taipei City: Directorate-General of Budget, Accounting, and Statistics, (DGBAS), Executive Yun. Retrieved from http://eng.stat.gov.tw/ct_view.asp?xItem=8488&ctNode=1650

Galloway, H. (2015). Understanding community economies. In R. Phillips, & R. H. Pittman (Eds.), *An introduction to community development* (pp. 225-238). New York: Routledge, Taylor and Francis Group.

Giannakis, E. (2014). The role of rural tourism on the development of rural areas: The case of Cyprus. *Romanian Journal of Regional Science, 8*(1), 38-53.

Haddad, E., Silva, V., Porsse, A., & Dentinho, T. (2012). *Multipliers in an island economy: The case of the Azores* (pp. 1-26). Brazil: Department of Economics, University of São Paulo (FEA-USP).

Hearn, W., & Tanner, T. (2009). Assessing your local economy: industry composition and economic impact analysis. In R. Phillips, & R. H. Pittman (Eds.), *An introduction to community development* (pp. 166-180). USA: Routledge.

Horváth, E., & Frechtling, D. C. (1999). Estimating the multiplier effects of tourism expenditures on a local economy through a regional input-output model. *Journal of Travel Research, 37*(4), 324-332. http://dx.doi.org/10.1177/004728759903700402

Kay, D. L., Pratt, J. E., & Warner, M. E. (2007). Role of services in regional economy growth. *Growth and Change, 38*(3), 419-442. http://dx.doi.org/10.1111/j.1468-2257.2007.00377.x

Khanal, B. R., Gan, C., & Becken, S. (2014). Tourism inter-industry linkages in the Lao PDR economy: An input–output analysis. *Tourism Economics, 20*(1), 171-194. http://dx.doi.org/10.5367/te.2013.0255

Kweka, J., Morrissey, O., & Blake, A. (2001). *Is tourism a key sector in Tanzania? Input-output analysis of income, output, employment and tax revenue* (Elektronische Ressource ed.). UK: Christel DeHaan Tourism and Travel Research Institute.

Mazumder, M. N. H., Ahmed, E. M., & Al-Amin, A. Q. (2009). Does tourism contribute significantly to the Malaysian economy? Multiplier analysis using i-o technique. *International Journal of Business and Management, 4*(7), 146-159. http://dx.doi.org/10.5539/ijbm.v4n7p146

Miller, R. E., & Blair, P. D. (2009). *Input-output analysis: Foundation and extensions* (2nd ed.). New York: Cambridge University Press. http://dx.doi.org/10.1017/CBO9780511626982

NDC. (2000). *Offshore islands development act.* Taipei, Taiwan: National Development Council (NDC).

ODC. (2007). *Final account of offshore island development fund, 2007*. Taipei, Taiwan: Offshore Development Council (ODC).

ODC. (2008). *Final account of offshore island development fund, 2008*. Taipei, Taiwan: Offshore Development Council (ODC).

ODC. (2009). *Final account of offshore island development fund, 2009*. Taipei, Taiwan: Offshore Development Council (ODC).

ODC. (2010). *Final account of offshore island development fund, 2010*. Taipei, Taiwan: Offshore Development Council (ODC).

ODC. (2011). *Final account of offshore island development fund, 2011*. Taipei, Taiwan: Offshore Development Council (ODC).

ODC. (2012). *Final account of offshore island development fund, 2012*. Taipei, Taiwan: Offshore Development Council (ODC).

ODC. (2013). *Final account of offshore island development fund, 2013*. Taipei, Taiwan: Offshore Development Council (ODC).

Okubo, S., & Planting, M. A. (1998). U.S. travel and tourism satellite accounts for 1992. *Survey of Current Business*, July, 8-22.

Oosterhaven, J., & Fan, T. (2006). Impact of international tourism on the Chinese economy. *International Journal of Tourism Research, 8*(5), 347-354. http://dx.doi.org/10.1002/jtr.582

Polo, C., & Valle, E. (2008). An assessment of the impact of tourism in the Balearic Islands. *Tourism Economics, 14*(3), 615-630. http://dx.doi.org/10.5367/000000008785633604

PTCG. (2007). *2006 Pingtung County statistical yearbook.* Pingtung County Pingtung County Government (PTCG). Retrieved from http://web.pthg.gov.tw/planfas/PublicInfo_Detail.aspx?s=642&n=12518

PTCG. (2012). *2011 Pingtung County Statistical Yearbook.* Pingtung County: Pingtung County Government (PTCG). Retrieved from http://web.pthg.gov.tw/planfas/PublicInfo_Detail.aspx?s=2853&n=12518

PTCG. (2014). *Pingtung County Statistical Yearbook 2013*. Pingtung County: Pingtung County Government (PTCG). Retrieved from http://web.pthg.gov.tw/planfas/PublicInfo_Detail.aspx?s=4319&n=12518

Soulie, J., & Valle, E. (2014). Trade effects of specialization in tourism: an inter-regional input–output model of the Balearic Islands. *Tourism Economics, 20*(5), 961-985. http://dx.doi.org/10.5367/te.2013.0312

Tohmo, T. (2004). New developments in the use of location quotients to estimate regional input–output coefficients and multipliers. *Regional Studies, 38*(1), 43-54. http://dx.doi.org/10.1080/0034340031000163226 2

Vellas, F. (2011). *The indirect impact of tourism: an economic analysis*. Paper presented at the Third Meeting of T20 Tourism Ministers, Paris, France.

Wall, G. (1997). Scale effects on tourism multipliers. *Annals of Tourism Research, Research Notes and Reports, 24*(2), 446-450.