The Future Development of Ecotourism in Taiwan

A Study of Cycling Tourism Development

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Abstract

In recent years, more and more information inspire people's environment awareness. Cycling tourism becomes one of the new types of tourism. This research focuses on the differences among the administrative regions in Taiwan. We collected many secondary data from governmental website, then used cluster analysis and discriminant analysis as the methodology. The twenty-two counties and cities in Taiwan were divided into four groups and named as "Pioneers", "Laggards", "Passionate Practitioners" and "Steady Runners" based on their degree of cycling development and resident's frequency usage of cycling. After having deeply understandings of Taiwan's counties and cities, we discovered that the region which has better development may have common characteristics. On the contrary, there will be some features of those regions whose cycling industry has poor development. We made some implication as our conclusion in the research and hope Taiwan can become a green country in the future.

Acknowledgement

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I. Introduction

1.1 Motivation

After Al Gore, the former Vice President of the US, released the documentary "An Inconvenient Truth," the issue of global warming has become seriously concerned by the world. As the threatening environmental destruction is getting serious and serious, the environmental consciousness arises quickly, which makes "carbon free life" become a hot issue. Reducing the production of greenhouse gas is one of the ways to protect the planet, and thus turns to one of each authority's primary goals. Moreover, many natural resources now people use, such as petroleum and gasoline, are limited, and the usable amount of them are decreasing fast. Lower down the usage of this kind of natural resources and reach the goal of sustainable development is a big issue for people all over the world. Also, energy efficiency has proved to be a cost-effective strategy for building economies without necessarily growing energy consumption.

Of the options available, cycling tourism, as a type of ecotourism, is highly profiled, for reasons that ecotourism can help environmental protection, and cycling is an especially environmental-friendly and sustainable tourism category.

Taiwan has been developing cycling tourism since the 1990s. After movie

directors took cycling tourism as their topics and made popular films, riding bicycles

are now one of the options while people are planning their trips. This two-wheel

design is no more a simple transportation tool, but a way for people to travel and

experience different kinds of fun.

It is also recognized that, just as with other forms of theme tourism, there is little

researchers studying about the area of cycling tourism, or its motivation, development

and consequences. For understanding more about this important and interesting area,

the following researches will try to identify some of the parts that require more

structured information.

1.2 Research Objectives

Based on the findings of Chou (2003), "the spatial distribution of travel and

leisure is not even and there are the urban-rural differences in Taiwan", we are curious

about this kind of phenomenon, so the overall objectives of research is to investigate

the cycling tourism in Taiwan in order to establish whether difference of cycling

development among regions exist or not. The research objectives can be stated as

follows:

a.   To clarify whether cycling is a perfect type of tourism – i.e. tourism with a good
     income and very little environmental cost.

b. Find out how the differences among regions[1] affect their development of cycling

tourism.

c. To evaluate the performance of cycling tourism by the authorities and give the

government suggestions.

1.3 Terminology

The terms in this research: define the terms: the tourist, the tourism and the

cycling tourist are defined as follows.

a. The tourist

According to World Trade Organization (WTO), the definition of tourist is: *Any*

person, who travels to somewhere that is not his or her usual surroundings for less

than 12 months, and the most important objectives of the journey is other than

salaried activities at the destination.

b. The tourism

The areas covered by the terms of tourism and tourist industry have been

discussed often. Some have said that tourism is not an industry but a phenomenon.

Here in this project, the tourism will be defined as: *Activities by persons travelling to*

a different destination than their surroundings for no more than 1 year, whether

engaged in leisure or business activities.

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[1] Regions are different counties and cities in Taiwan.

c. The cycling tourist

In this project the cycling tourist is defined as: *A cycling tourist is a person of any region in Taiwan, who at some stage or during his or her leisure time uses the bicycle as a mode of transportation.*

Local residents and cycling for recreational purpose are included.

1.4 Introduction of Taiwanese regions

There are seven cities and 15 counties in Taiwan Main Island. Table 1 shows the regions' population, area size, length of cycling paths, education and employment percentage in different fields.

Table I. Introduction of Taiwanese regions

	Population (Thousand)	Area (km^2)	Length of Cycling Paths (km)
Taipei City	2603	271	221.678
Taipei County	3884	2052	293.01
Taoyuan County	1985	1220	193.35
Keelung City	387	132	6.775
Hsinchu City	413	104	21.5
Hsinchu County	512	1427	5.5
Miaoli County	561	1820	139.52
Taichung City	1077	163	49.023
Taichung County	1562	2051	45.8
Changhua County	1311	1074	77.771
Chiayi County	546	1903	176.47
Chiayi City	273	60	24
Tainan County	1103	2016	89.649
Tainan City	771	175	41.512
Kaohsiung County	1243	2792	52.861
Kaohsiung City	1528	153	153.577
Pingtung County	880	2775	95.295
Taitung County	232	3515	307.373
Hualien County	340	4628	208.067
Yilan County	461	2143	103.025
Nantou County	529	4106	57.455
Yunlin County	721	1290	62.86

Table I. Introduction of Taiwanese regions (continued)

	Education (above junior high college)(%)	Employed Person: Industry (%)	Employed Person: Services (%)	Employed Person: Agriculture, Forestry, Fishing and Animal Husbandry (%)
Taipei City	58.88	19.28	80.55	0.18
Taipei County	35.87	37.04	62.45	0.5
Taoyuan County	33.09	46.36	52.14	1.5
Keelung City	32.48	28.57	71.09	0.34
Hsinchu City	43.64	40.3	59.02	0.69
Hsinchu County	32.88	52.78	44.96	2.26
Miaoli County	25.7	46.71	47.58	5.71
Taichung City	48.53	28.28	70.93	0.79
Taichung County	28.97	47.96	47.37	4.67
Changhua County	26.49	46.33	42.96	10.7
Chiayi County	21.42	31.73	46.24	22.03
Chiayi City	47.11	26.39	71.59	2.02
Tainan County	27.13	44.24	46.3	9.46
Tainan City	41.53	37.5	61.01	1.48
Kaohsiung County	27.27	41.04	51.38	7.59
Kaohsiung City	41.91	29.91	69.35	0.75
Pingtung County	25.34	30.29	52.71	17
Taitung County	17.94	19.61	54.98	25.41
Hualien County	27.39	24.08	66.03	9.15
Yilan County	27.19	31.31	62.06	6.64
Nantou County	26.11	25.96	52.68	21.36
Yunlin County	23.4	32.78	46.59	20.63

II. Literature review

2.1 New types of tourism

The United Nations (UN) classified three forms of tourism in1994：

a. Domestic tourism, which involves residents of the given country traveling only within this country.

b. Inbound tourism, involving non-resident traveling in the given country.

c. Outbound tourism, involving residents traveling in another country.

In the past, tourism was regarded as traveling only for leisure, but nowadays people don't travel simply for leisure. Now there are many people who participate in various new types of tourism in the world and they have different purposes to travel. New types of tourism refer to the specialty travel forms of tourism that have emerged in recent years.

According to Wikipedia, new types of tourism can be separated into 11 parts, including adventure and extreme, culture and the arts, food and drink, historical, low-impact, medical and dental, miscellaneous, nature and rural, religious, voyeuristic as well as water-related tourism. Many of these new types of tourism have come into common use by the tourism industry such as medical tourism and ecotourism. However, some new types of tourism are emerging concepts that may or

may not become popular usage such as dark tourism.

2.2 Cycling tourism

In such warming global, energy conservation (or low-carbon economy) is a very important issue in this world. The eco-tourism focuses on minimum environmental impact, minimum cultural impacts, maximum economic benefits to host country, and maximum recreation satisfaction. (Pucher & Komanoff, 1999)

As known by the whole world, Taiwan is the biggest bicycle producer globally. However, the Taiwanese did not ride bicycles for leisure before year 2000. Most of them rode bicycles mainly for transportation or commuting. Unlike other western countries, which take cycling tourism into major consideration while planning to travel, the Taiwanese focus on cycling tourism because of governments' policy and encouragement. (Cheng, 2004)

Benefits of promoting cycling tourism

The government's promotion on cycling tourism leads to different aspects of benefits. According to the research, if the government promotes cycling tourism in Taiwan, the following benefits will show up. (Pucher & Komanoff, 1999)

a.   Social benefits:

People will become healthier if they ride bicycles often, and thus reduce medical expenses. If the government promotes cycling tourism, the region will become a

healthy environment.

b. Environmental benefits:

   In comparison with vehicles that produce carbon dioxide, bicycles are an

environment-friendly transportation tool. It does not produce carbon dioxide or other

emissions that damage the environment. If people use bicycles when traveling, the

world will be less harmed.

c. Industrial benefits:

   If the government encourages people to use bicycles, the consumption on

bicycles will grow, and thus leads to the growth of cycling-related industry.

Companies and shops which produce bicycles and provide related services will get the

benefits.

d. Governmental benefits:

   By promoting cycling tourism, it is very possible for the government to increase

more working opportunities and tourism income. Every district in the country will get

further development and become a better place for living and tourism as well.

Motivation for citizens to use bicycles

The Taiwan Travel and Leisure Indicator System (Chou, 2003) clarifies four

major reasons for people's riding:

a.   Recreation resources and facilities

b.   Activities and events

c.   Leisure and travel supply system

d.   Leisure and travel participations

Three out of the four factors such as "recreation resources and facilities",

"activities and events", as well as "leisure and travel supply system" directly relate to

the governments' development, and this infers that what the governments do greatly

affect the development.

In addition, according to the research, bicycle riders' motivation and recognition

are affected by many different factors. Most of the factors are demographic variables.

Possible factors are as follows:

a. Educational level and riding partners   (White, 1975; Kelly, 1987; Chou, 2003),

b. Gender (Hartman, 1989; Chou, 2003; Chao & Chang, 1999),

c. Age and income (Rapoport, 1982; Hultsman, 1986; Pucher &Komanoff, 1999),

d. Occupation (Chou,2003),

e. City size and density (Pucher & Komanoff, 1999),

f. Marital status and residential location (Hou, 1999),

g. Riding environment (Chou,2003)

Riding environment involves the length of trail, the separation with mobile trail,

the open-wideness, nature, diversity, complexity, inexplicability, uniqueness,

harmonization, and integration of the surrounding landscape. Thus, riders with

different riding motivations will have different satisfactions on environmental

attributes. (Lin, 1998)

Differences among regions

Because of different policies and resources, respective regions have different

cycling tourism developmental situations. In order to have further understanding

about the factors that affect the development of cities and counties, we complete the

following research; and based on the findings above, separating the factors into two

categories: factors of users and factors of governments.

a. Factors of users

The users' attitude toward cycling, concept of environmental protection and

their past cycling travel experiences affect their acceptance of traveling by bicycles.

People tend to participate in cycling tourism more if they have better past experience.

(Pucher & Komanoff, 1999)

Number of bicycle sales and mean number of vehicles per household (Pucher &

Komanoff, 1999) are also important factors for understanding the differences among regions. If the region's mean number of vehicles per household is high, the number of bicycles a household has is less.

b. Factors of governments

As mentioned above, governments' efforts are the most important factors which affect the developmental situation of regions. The economic development strategies play an important role in the development of cycling tourism. Safe, clean and user-friendly bicycle paths or other facilities make people travel in a safe and comfortable environment. Numbers of facilities such as parks, recreation and cultural facilities, and the quantity and quality of travel services are also part of the factors that attract people to travel more with bicycles. (Dill and Carr, 2003)

Besides the direct efforts and investment from governments, organizations help the governments to promote cycling as well. If there are more organizations encourage people to ride bicycles, that region's cycling percentage will be higher.

III. Methodology

3.1 Data collection:

We collected secondary data from the following government organizations:

a. National Statistics, R.O.C. (Taiwan)

b. Ministry of Transportation and communications, R.O.C. (Taiwan)

c. Urban and Regional Development Statistics, CEPD R.O.C. (Taiwan)

Figure I. Data for different analysis
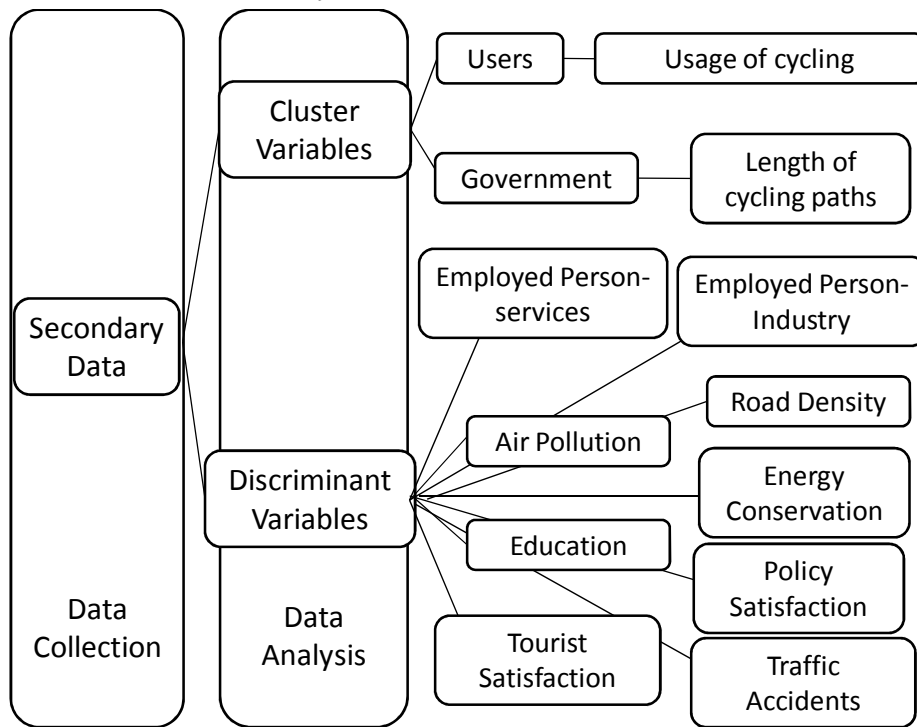
3.2 Cluster analysis

Cluster analysis classifies a set of observations into two or more mutually exclusive unknown groups based on combinations of variables. The purpose of cluster analysis is to discover a system of organizing observations into groups where members of the groups share the same characteristics. It is cognitively easier for people to predict behavior or characteristics of objects based on group membership, all of whom share similar properties.

In this research, we will choose the number of groups according to the result of

the cluster analysis. Then use K-means to ensure that the classification is suitable.

3.3 Discriminant analysis

Discriminant analysis is a statistical technique which allows the researcher to study the differences between two or more groups of objects with respect to several variables simultaneously. In short, this multivariate analysis is a technique of discriminant and grouping. It is the appropriate statistical techniques when the dependent variables is categorical (nominal or nonmetric) and the independent variables are metric.

Except for cluster variables, we also collected many variables which may affect the development on cycling tourism among counties and cities in Taiwan. In the second step of the analysis, we use discriminant function, which consists of a set of Living Index Variables, to explain each cluster's behavioral pattern. After running discriminant analysis, it would be possible to tell the differences among the groups and understand how the differences affect the development of cycling tourism.

3.4 The Research Question and Hypotheses

Research question: How do the differences among regions affect their development of cycling tourism?

The research objects are the 22 regions in Taiwan Main Island. According to the

literature review, we know that the spatial distribution of travel and leisure is not even

and there are the urban-rural differences among Taiwan regions. We try to figure out

how the differences mentioned before in the literature review relate to and affect the

development of cycling tourism in each region.

The hypothesis is: Differences of developing cycling tourism exist among regions

in Taiwan. And the differences among the regions will affect the development of

cycling tourism.

IV. Results and discussion

4.1 The Grouping of Observations

Based on the combinations of the three cycling behavior variables, the 22

observations of Taiwanese regions are classified into groups. The different

characteristics will not be clearly recognized if they are only separated into two or

three groups. On the other hand, if the observations are separated into five or six

groups, there will only have one or two observations be in the fifth or sixth group,

which is not enough for the following research. As a result, the observations are

separated into four groups. This is the most appropriate number of groups.

The regions in each group are:

Group 1: Taipei City, Taipei County, Taoyuan County and Taitung County.

Group 2: Keelung City, Hsinchu City, Hsinchu County, and Taichung County.

Group 3: Yilan County, Hualien County, Changhua County, Yunlin County, Chiayi City, Chiayi County, Tainan County and Pingtung County.

Group 4: Miaoli County, Taichung County, Nantou County, Kaohsiung City, Tainan City and Kaohsiung County.

Table II. Numbers of clusters

Regions	Numbers of Clusters				
	6	5	4	3	2
Taipei City	1	1	1	1	1
Keelung City	2	2	2	2	1
Hsinchu City	2	2	2	2	1
Taipei County	1	1	1	1	1
Yilan County	3	3	3	3	2
Taoyuan County	1	1	1	1	1
Hsinchu County	2	2	2	2	1
Taichung City	2	2	2	2	1
Miaoli County	4	4	4	2	1
Taichung County	4	4	4	2	1
Changhua County	3	3	3	3	2
Nantou County	4	4	4	2	1
Yunlin County	5	5	3	3	2
Tainan City	4	4	4	2	1
Chiayi County	6	3	3	3	2
Tainan County	3	3	3	3	2
Kaohsiung County	4	4	4	2	1
Pingtung County	3	3	3	3	2
Taitung County	1	1	1	1	1
Hualien County	6	3	3	3	2

Table III. Numbers of clusters (Continued)

| Kaohsiung City | 4 | 4 | 4 | 2 | 1 |
| Chiayi City | 3 | 3 | 3 | 3 | 2 |

Naming of the groups

After grouping all the observations, we name each group based on the result of

k-means.

Table IV. The result of K-means

	Cluster			
	1	2	3	4
Average length of cycling paths (km)	52.010	1.375	12.880	51.000
The usage rate of cycling in tourism and leisure (%)	3.23	1.10	3.88	2.10
Using bike as the most commonly used mode of transport. (%)	10.62	3.56	11.88	6.63

The first group is named as "Pioneers" according to the longest average length of

cycling paths and the big number of bicycle usage rate. "Laggards" is the name of the

second group because the numbers of each variable are the smallest among the others.

They are least expected. Besides, due to the highest bicycle usage rate, we can see that

this group has passion but need development, the third group is named as "Passionate

Practitioners", while the forth group is named as "Steady Runners" because they have

the second-long average cycling paths and citizens are willing to take bicycles as their

traffic tools.

4.2 Statistical Results of Discriminant Analysis

Table V. Eigenvalue

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	2.398[a]	63.0	63.0	0.840
2	1.122[a]	29.5	92.5	0.727
3	0.287[a]	7.5	100.0	0.472

In the discriminant analysis, we can infer more than one discriminant function

between the corresponding of grouping variables and discriminant variables. However,

not all functions' discriminating degree is good enough to separate group from group.

Eigenvalues means the discriminating degree of each function. In the research, the "%

of variance" column, we can realize that function1's discriminating degree is 63.0%

and function2's discriminating degree is 29.5%. The cumulative percentage of them is

92.5%. It's means that the discriminating degree of funtion1 and 2 is good enough.

They can explain the grouping degree up to 92.5%. It also means that function3's

marginal discriminating degree is low and inefficiency. For this reason, function1 and

function2 are the main two functions we use.

Table VI. Functions at Group Centroids

Ward Method	Function		
	1	2	3
Pioneers	-2.600	.456	0.441
Laggards	1.137	1.830	-0.214
Passionate Practitioners	-0.257	-0.672	-0.536
Steady Runners	1.318	-0.627	0.563

Figure II. Canonical Discriminant Functions

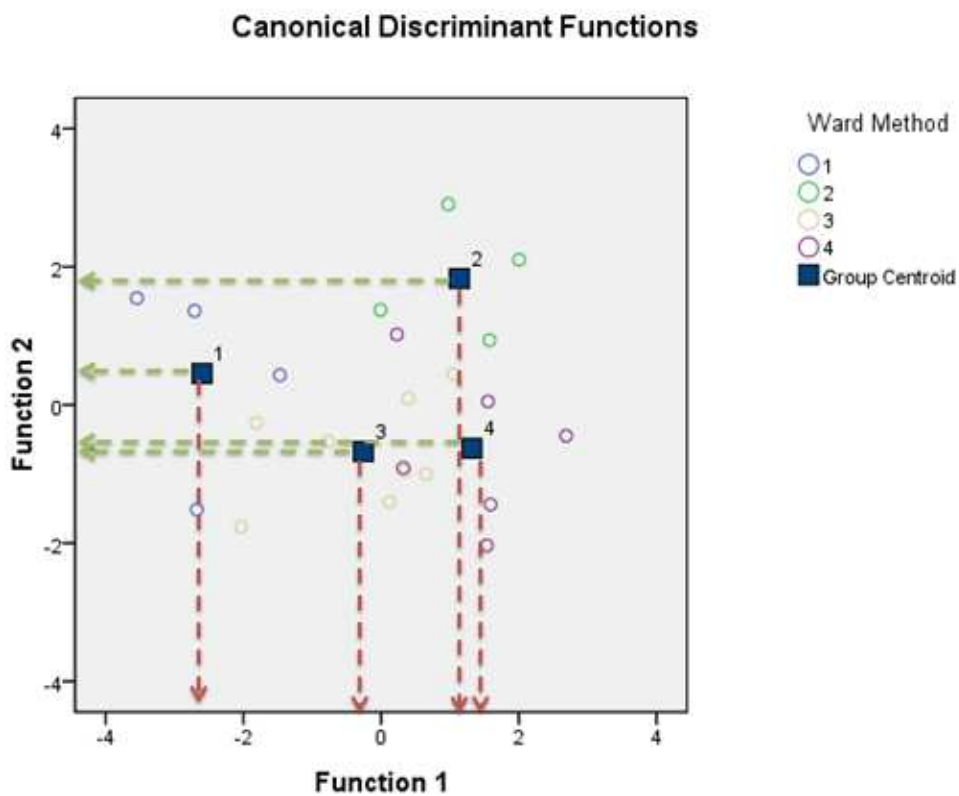**Canonical Discriminant Functions**

Table 5 is Functions at group centroids. The value in the table represent for each

groups' centroid coordinate on each function.

In Table 5, we put function1 and funtion2 on a plane, and marked each groups' centroid coordinate on the coordinate axes. X-axis represents for function1, and y-axis represents for function2. Then, we project each group's centroid on x-axis. We find that point1 and 3 is on the negative side of function1, and point2 and 4 is on the positive side. Then we can interpret that function1 separate point1 and 3 from point2 and 4. Same as function2, we project each group's centroid on y-axis. We find that point3 and 4 are on the negative side and point1 and 2 are on the positive side. We can infer that function2 separate point1 and 2 from point3 and 4.

Table VII. Structure Matrix

Variables	Function		
	1	2	3
Employed Person-Services	0.200*	0.034	0.150
Employed Person-Industry	0.200*	-0.077	-0.128
Air pollution(total suspended particulates)	0.078	-0.596*	0.199
Road Density	0.332	-0.561*	0.113
Education(above junior college)	0.367	-0.543*	-0.269
Satisfaction of tourism	-0.013	0.413*	0.342
Satisfaction of Policy	0.204	-0.307*	0.029
Satisfaction of Energy Conservation	-0.102	0.293*	0.175
Road Traffic Accident of Casualty(cases per 10,000 people)	0.152	0.236*	0.76

Note: * means that variable supports that discriminant function to separate the groups.

Table 6, Structure Matrix can give us more information after we know how the functions discriminate four groups. In this table, the value represent for the correlation between variables and discriminant function. The number which is marked by the star means it supports that discriminant function to separate the groups. For example, the first two variables (Employed Person-Services and Employed Person-Industry) support function1 to separate point1 and 3 from point2 and 4. And the other variables support function2 to separate point1 and 2 from point3 and 4.

Table VIII. Group statistics

	Pioneers	Laggards	Passionate Practitioners	Steady Runners
Employed Person-Services	**62.5300**	**61.5000**	54.4038	54.8950
Employed Person-Industry	30.5725	**37.4825**	33.3938	**38.1800**
Air pollution(total suspended particulates)	64.9175	70.9650	**79.8575**	**86.2267**
Road Density	2.1350	**4.5975**	2.1850	**3.1583**
Education(above junior college)	**36.4450**	**39.3825**	28.1838	31.9150
Satisfaction of tourism	65.0000	66.7500	**70.7500**	**73.5000**
Satisfaction of policy	65.0000	68.7500	**73.1250**	**74.3333**
Satisfaction of Energy Conservation	66.2500	64.5000	**68.0000**	**68.8333**
Road Traffic Accident of Casualty(cases per 10,000 people)	90.1600	**113.4225**	112.0113	**117.4700**

Note: Bold values mean the group have a bigger value in that variable.

In Table7, we can see the means of every variable in each group. The number which we highlight means they have a bigger value in that variable. Like in the variable-employed person (services), we can know that pioneers and laggards have higher percentage of people who engaged in services. The more deeply explanation between these variables and cycling tourism will be brought up latter.

Table IX. Classification Results

			Predicted Group Membership				Total
		Ward Method	Pioneers	Laggards	Passionate Practitioners	Steady Runners	
Original	Count	Pioneers	4	0	0	0	4
		Laggards	0	4	0	0	4
		Passionate Practitioners	2	0	5	1	8
		Steady Runners	0	0	0	6	6
	%	Pioneers	100.0	.0	.0	.0	100.0
		Laggards	.0	100.0	.0	.0	100.0
		Passionate Practitioners	25.0	0.0	62.5	12.5	100.0
		Steady Runners	.0	.0	.0	100.0	100.0

By using discriminant analysis, it is easy to tell whether the grouping result that the cluster analysis provided is the same with the prediction or not. According to table 8, Pioneers, laggards and steady runners are correctly separated, but passionate practitioners have some differences. From the cluster analysis, there are eight counties in this group. But according to the discriminant function, there are two counties should be put in the group of pioneers and one county should be put in the group of

steady runners. So there are 86.4 % of original grouped cases correctly classified.

Explanation of discriminant variables

  a. Employment

Table X. Employment

	Pioneers	Laggards	Passionate Practitioners	Steady Runners
Employed Person-Services	62.5300	61.5000	54.4038	54.8950
Employed Person-Industry	30.5725	37.4825	33.3938	38.1800

Pioneers have the largest gap between Services and Industry and they also have

the lowest percentage of employed person-industry. The passionate practitioners have

the second lowest percentage of employed-industry. We can infer that people who are

employed in the industry are less willing to participate in cycling tourism.

  b. Road Density

Table XI. Road Density

	Pioneers	Laggards	Passionate Practitioners	Steady Runners
Road Density	2.1350	4.5975	2.1850	3.1583

The laggards' road density is the highest and they develop the worst cycling

tourism between four of them. However, Pioneers as well as Passionate Practitioners

have lower road density and they have more passion to participate in cycling tourism.

We can infer that regions with high road density are also the places that are less

developed in cycling tourism.

c. Air Pollution

Table XII. Air pollution

	Pioneers	Laggards	Passionate Practitioners	Steady Runners
Air pollution(total suspended particulates)	64.9175	70.9650	79.8575	86.2267

Pioneers have minor air pollution problem and they develop cycling tourism better.

Nevertheless, Passionate Practitioners have more serious air pollution problem

because there are some industrial area. But Passionate Practitioners still have passion

to participate in cycling tourism. We infer that people may have a delusion about air

pollution; people might think the air pollution made by vehicles is more serious than

by industries.

d. Education and Satisfaction

Table XIII. Education and Satisfaction

	Pioneers	Laggards	Passionate Practitioners	Steady Runners
Education (above junior college)	36.4450	39.3825	28.1838	31.9150
Tourist Satisfaction	65.0000	66.7500	70.7500	73.5000
Policy Satisfaction	65.0000	68.7500	73.1250	74.3333
Energy Conservation	66.2500	64.5000	68.0000	68.8333

Passionate Practitioners and Steady Runners have higher satisfactions and they

have lower percentage of education—above junior college. We infer that higher

satisfaction leads to higher usage of bicycles. People with higher-education are picky

to policy so satisfactions of Pioneers and Laggards are lower than the other. We also

infer that when the development of cycling tourism is not very well, it is hard to

attract them to participate in the cycling tourism.

e. Road Traffic Accident of Casualty

The more serious the traffic accident problem is, the less participant in cycling
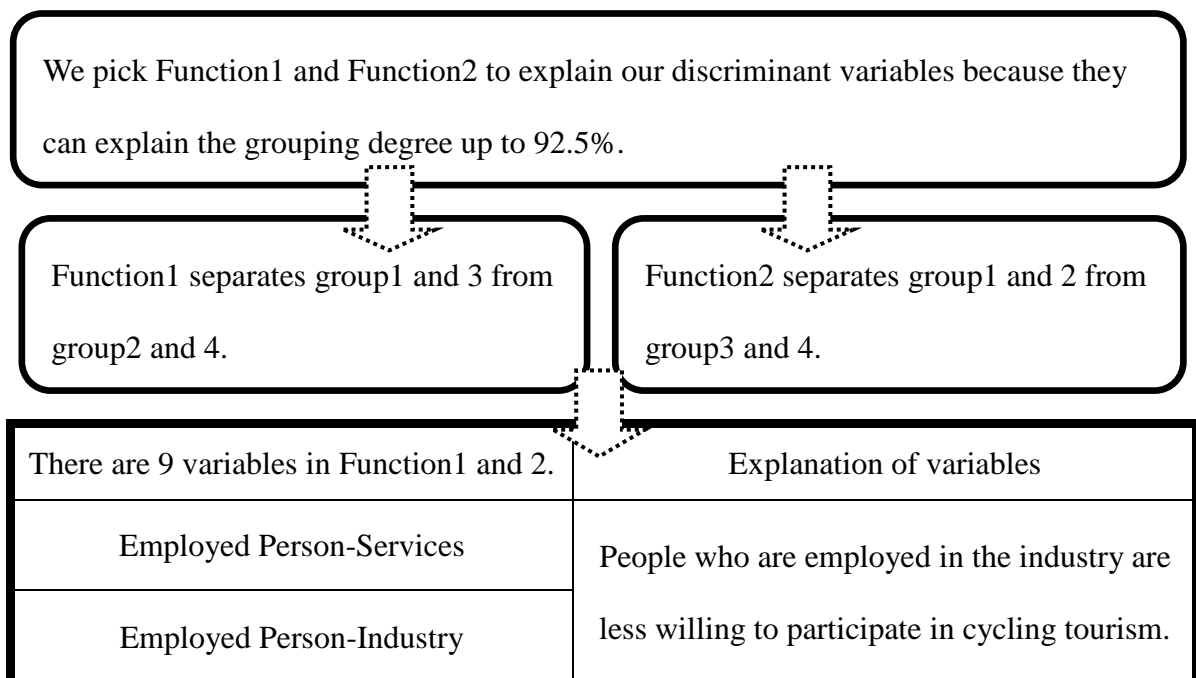
tourism.

Table XIV. Road traffic accident of casualty

	Pioneers	Laggards	Passionate Practitioners	Steady Runners
Road Traffic Accident of Casualty(cases per 10,000 people)	90.1600	113.4225	112.0113	117.4700

Laggards, Steady Runners and Passionate Practitioners all have serious traffic

accident problem instead of Pioneers. We can infer that the more serious the traffic

accident, the less participant in cycling tourism.

4.3 Conclusion

In our research, we firstly used cluster analysis to separate the 22 regions in

Taiwan. They were separated into four groups, which showed their characteristics of

cycling tourism development. These groups were named as Pioneers, Passionate

Practitioners, Steady Runners and Laggards. Pioneers have the longest average length

of bicycle paths, and Passionate Practitioners have the highest usage rate of bicycles.

Second, we used discriminant analysis to explain each group's behavioral pattern. The

software SPSS came out three functions by analyzing all the variables we put, we

picked function1 and function2 to do the following study based on the Eigenvalue.

Figure 3 explained the summary of the discriminant analysis.

Figure III. The summary of the discriminant analysis.

Air pollution	Regions with minor air pollution problem develop cycling tourism better.
Road Density	Regions with high road density are also the places that are less developed in cycling tourism.
Education(above junior college)	Higher satisfaction leads to higher usage of bicycles. When the development of cycling tourism is not very well, it's hard to attract them to participate in the cycling tourism.
Satisfaction of tourism	
Satisfaction of Policy	
Satisfaction of Energy Conservation	
Road Traffic Accident of Casualty	The more serious the traffic accident problem is, the less participant in cycling tourism.
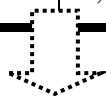
We got 86.4 % of original grouped cases correctly classified.

V. Implications

Based on the findings through cluster analysis and discriminant analysis, and also take each group's resource and characteristics into consideration, we provide suggestions for the authorities.

In Taiwan, the central government makes main policies, and local governments made detail policies based on the main plans, so we provide implications for both

central government and local governments.

5.1 For the central government

The central government should encourage people to use bicycles instead of cars or other vehicles, and thus reduce the production of greenhouse gas, and make the roads less crowded. Besides, it can increase the budget of improving cycling tourism, for local governments to build more bicycle paths or to develop promoting programs.

5.2 For the local governments

a. **Governments of pioneers:**

This group includes the biggest and most important city in Taiwan, and also the city which is the first to develop cycling tourism. The average length of the bicycle paths in the group is the longest in comparison with other groups. The usage rate of bicycles is high, and people are strict to the governments' strategies.

The suggestions to this group is to set "Becoming cycling tourism leading regions" as their goals, take foreign cities which are successful on the development of cycling tourism as role models, and keep maintaining the quality of bicycle paths. Furthermore, continue to encourage citizens participating in cycling tourism, and design special bicycle traveling trips for foreign tourists with the regions' abundant cultural and traveling resources.

b. Governments of passionate practitioners

This group involves most of the commodity industries in Taiwan. The usage rate of bicycles is the highest among the others, but the average length of bicycle paths is comparatively low.

The suggestions for this group are to build more bicycle paths, and combine the characteristic of commodity industry, cooperate with local farms to provide special eco-tourism trips.

c. Governments of steady runners

The average length of bicycle paths is high but the usage rate of bicycles is relatively low in this group. Moreover, the number of traffic accidents in this group is the highest among the others. The situation of traffic is poor and thus people think riding bicycles in these regions are dangerous.

Based on the information above, the suggestions for steady runners' governments are to take "Creating a safe cycling environment" as the priority, after reaching this goal, people will be more willing to use bicycles as their traveling transportation tool. Besides, the governments can also work with private organizations to hold more activities to increase the usage rate of bicycles.

d. Governments of laggards

The average length of bicycle paths and the usage rate of bicycles are the lowest

in the regions of Laggards. However, the road density is the highest.

We suggest the governments of Laggards to advocate the usage of bicycles and increase the safety of riding bicycles. The governments of these regions do not need to build bicycle paths, but can encourage people to ride bicycles on roads on the premise that the traffic situation is good enough.

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