The Wild Side of Tourism: A Case Study of Economic Values and Impacts of Hunting in Pennsylvania

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Abstract: This research answers two questions: (1) what is the annual economic value of the Pennsylvania's hunting resources, and (2) what are the annual economic impacts from the use of those resources? A mail survey was used to collect data on hunters' annual trip and equipment expenditures for hunting, and on wildlife-watching activities away from home within the state. Results of the travel cost method (TCM) showed that the annual values of the hunting resources and the wildlife watching resources were $6.39 and $0.49 billion, respectively. Results of the Impact Analysis for Planning (IMPLAN) model indicated that the annual economic impact of hunting on the state's economy was $2.39 billion. This information can be used with biological data, results of public opinion, and surveys about game management to formulate policy decisions that help match availability of hunting and wildlife watching resources with future demand.

Keywords: Hunting, wildlife watching, economic value, economic impacts

The Commonwealth of Pennsylvania ranks third nationally in the number of resident hunters (U.S. Department of the Interior 1993, 1997). Although it is the home of three large metropolitan areas, the Commonwealth is largely a rural state, with a population of approximately 11 million. At the time of this study, Pennsylvania had approximately 1.1 million licensed hunters. Consumptive and non-consumptive use of wildlife by licensed Pennsylvania hunters is traditional leisure-time activities that produce economic impacts for many individuals and businesses. The wildlife "industry", comprised of small and large businesses, is not often thought of as an industry in the traditional sense. Unlike steel or textile industries which are easily identified by large factories and transportation systems, the hunting and wildlife watching industry is comprised of widely scattered manufacturers, wholesalers, and retailers, that when considered together, form a network industry.

Credible economic data are essential if policy makers and resource managers are to fully discharge their responsibilities to sustain hunting and wildlife watching resources for future generations. The purpose of this study was to determine: (1) the economic value of Pennsylvania's hunting resources and (2) the impact of the use of those resources on the state's economy for a 12-month period in 1995-96. Economic value is a non-business-oriented measure that estimates the value hunters receive from the use of the hunting resources and therefore is a surrogate measure of the value of the resource. Economic impact of hunting addresses the business and financial dollars generated within the Commonwealth as a result of hunters' equipment purchases.

Economic Values of the Resource

The Travel Cost Method (TCM) can be used to estimate the economic value of hunting resources and the nonconsumptive value hunters place on the state's wildlife-viewing resources, based on money spent on trips to hunt and view those resources (Loomis and Walsh 1997).

In its most typical form the demand curve estimated by the zonal TCM is:

$$V_{ij} = f(C_{ij}, P_i, S_{ij}, A_j, D_i) \quad (1)$$

where V_{ij} = number of trips from origin i to site j

C_{ij} = cost of traveling from origin i to site j

P_i = population of origin i

S_{ij} = a measure(s) of the substitutes to site j for origin i

A_j = a measure(s) of characteristics of site j

D_i = a measure(s) of characteristics of origin i, including income and education

The expanded expression of the site demand curve does not affect the underlying concepts in the value calculation, but it increases the amount of calculations required in order to obtain a site demand curve for each origin zone (Rosenthal et al. 1984, Walsh et al. 1988).

A basic assumption of the TCM is that each hunter trip is taken to a single destination. For example, if a hunter leaves home and drives directly to one location and then returns directly home, we could assume the transportation costs (and therefore travel time) occurred exclusively to go to one hunting location.

In our study, a hunter trip was defined as any Pennsylvania resident licensed hunter, or out-of-state hunter with a Pennsylvania hunting license, spending part or all of one or more consecutive days hunting for one or more types of game in Pennsylvania before returning to the location where the trip began.

In an ordinary demand function for overall hunting activity within a state, the dependent variable to be explained is always the quantity (Q) demanded. In this study, Q was the total number of hunter trips per year. The list of independent variables that influence demand for hunting always includes a proxy for direct cost or price (P) (Loomis and Walsh 1997). Price in this study was a hunter's direct out-of-pocket expenses for a hunter trip. In the case of an out-of-state residence with a Pennsylvania hunting license (8 percent of all respondents), P only involved money spent in Pennsylvania during the hunter trip.

The objective of the TCM is to estimate consumers' surplus as the area below the demand curve and above average price, or the willingness to pay above-average payment. Consumer surplus represents the real saving to hunters because state agencies usually manage hunting resources at a cost that is less than it would be in a free market situation. Average consumer's surplus represents the real income retained by a hunter in his or her wallet or purse, in other words, the money he or she would have spent rather than not use the hunting resource of the Commonwealth (Figure 1).

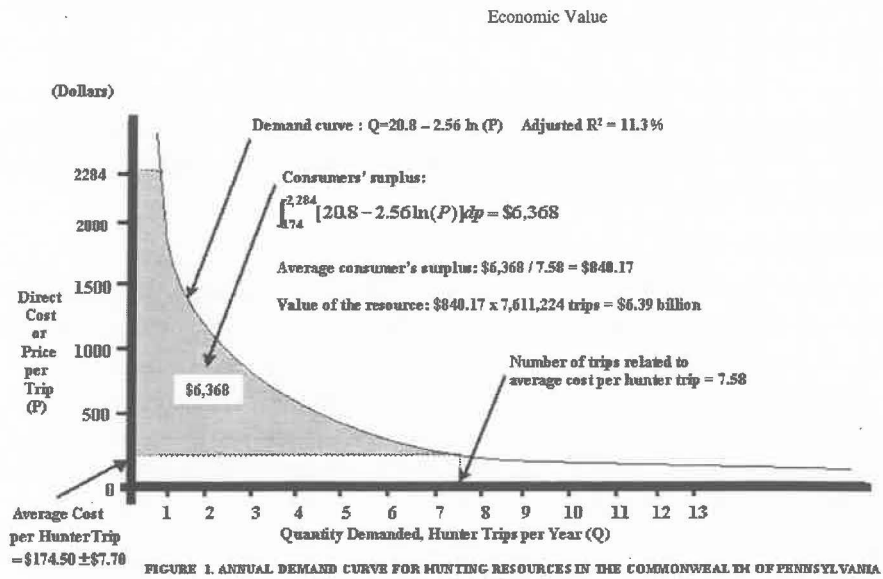

FIGURE 1. ANNUAL DEMAND CURVE FOR HUNTING RESOURCES IN THE COMMONWEALTH OF PENNSYLVANIA (1996 DOLLARS)

Economic Impact

When hunters purchase equipment, three types of economic impacts occur: direct, indirect, and induced (Alward et al. 1985, Alward et al. 1993, Brookshire et al. 1982). A direct impact is the initial purchase made by a hunter. For example, when a hunter buys a rifle in the state for $500, there is a direct impact for the retailer, and the economy, of $500. An indirect impact is the secondary effect from the purchase of that equipment. Indirect impacts imply that a business's sales benefit not only that business but also many industries that sell supplies and services to that business. An induced impact results from the wages and salaries paid by the directly and indirectly impacted industries to its employees. The employees of these industries, in turn, spend their income. These expenditures are termed induced impacts. They, in turn, create a continual cycle of indirect and induced effects (Minnesota IMPLAN Group 1997, Southwick Associates nd). The fact that specific types of hunting equipment may be purchased in a given year, and then used for several years is not relevant in IMPLAN calculations. The economic impacts of the purchase(s) as measured by IMPLAN occur in the year in which the purchase was made.

IMPLAN was used in this study to measure the economic impacts (in 1996 dollars). IMPLAN was originally developed by the USDA Forest Service in cooperation with the Federal Emergency Management Agency and the USDI Bureau of Land Management to assist the Forest Service in land and resource management planning (Alward et al. 1985), and is especially useful in depicting the economic impacts of outdoor recreation activities in an overall economy (Johnson and Moore 1993).

Economic impacts (direct, indirect, and induced) can be computed for each of seven economic categories: total economic effect (output), personal income, employment, employee compensation, proprietary income, other property type income, and indirect business taxes.

Collection of Data

Because a given hunter trip may involve visits to one or more geographically dispersed hunting resources over a period of one or more days, the probability of obtaining a reliable sample via on-site personal interviews throughout an entire state over a year's time is reduced considerably. Therefore, to obtain a representative sample of hunter trip and equipment costs in Pennsylvania over a 12-month period, a mail survey was used to obtain the data required for the TCM and IMPLAN analyses.

A return postage-paid mail survey questionnaire that contained seven questions designed to provide essential data for TCM and IMPLAN analyses was used

for the study. However, at the request of the Center for Rural Pennsylvania (the funding agency) and other cooperators, nine additional questions were added after the study was funded.

A total of 15,299 names and addresses of Pennsylvania licensed hunters were systematically sampled (approximately every 70th name) from the total of 1,130,000 hunters in a 1994 – 95 Game Take Survey of the Pennsylvania Game Commission. These files provided the most recent licensed hunter information available at the time the survey was planned. Sample size was proportional to each county's contribution to the total number of hunter licenses sold throughout the state. Large sample sizes were used to increase the likelihood that hunters would receive a questionnaire shortly after their most recent trip.

Based on the Pennsylvania Game Commission's estimates of annual hunting intensity in 1994, approximately 78% of all questionnaires were mailed between November 4 and December 4, 1995. A postcard reminder was sent to nonrespondents 2 weeks after the initial mailing and a second mailing of questionnaires was sent to nonrespondents 1 month later. These efforts had a marginal influence on overall total response rate. There were no significant differences between the results of the first and second mailing in terms of: average cost per trip, average total number of trips, percentage of hunters who actually hunted, and percentage of 6 types of special licenses purchased versus the total number of each licenses actually purchased by all hunters.

Several factors may have influenced the total 17.1% response from 2,627 hunters: amount of detailed information that hunters were asked to recall regarding expenditures for their past (most recent) trip; amount of detailed information that they were asked to recall about expenditures for hunting equipment during the previous 12 months; likelihood that the hunters would receive a questionnaire shortly after their most recent trip and thus be able to recall and estimate accurately the information requested; and time required to complete the questionnaire.

Analysis of Data and Results

Hunting

Approximately 95% of all respondents hunted during the sampling period, which amounted to a total of 7.6 million trips (Table 1). Because the sample was drawn from records of licensed hunters in 1994, part of the 5% who indicated they did not hunt may have included an unknown number of hunters who did not buy a license for the 1995 and/or the 1996 hunting season. The median number of hunter trips was 5, and the median number of days per trip was 3.

Table 1. Annual Total Values of Hunting and Nonresidential Wildlife-Viewing Resources (199 dollars)

Types of trips	(1) Total numbers of trips	(2) Average expenditure per trip[a]	(3) Total annual expenditures (billions)	(4) Average consumer surplus computed by TCM[b]	(5) Annual Total Resource Value (1)x(4)(billions)
Hunting	7,611,224[c]	$174.50 ± $7.70	$ 1.33	$840.17[e]	$6.39
Wildlife Watching	3,397,760[d]	$33.57 ± $4.30	$ 0.11	$143.27	$0.49

a. Expenditures were total out-of-pocket costs for transportation, lodging, food and beverage, and miscellaneous items.

b. Net economic value per trip, or the additional amount the typical hunter would have been willing to pay per trip over and above the actual experiences per trip. TCM = travel cost method.

c. 17,654 trips for the sample x 1,130,000 total hunters/2621 hunters in the sample = 7,611,224 total hunter trips.

d. 7,881 trips for the sample x 1,130,000 total hunters/2621 hunters in the sample = 3,397,760 wildlife watching trips.

About 75% of all trips occurred during big game seasons in November and December. In addition to a regular hunting license, 36% of hunters also had an antlerless-deer licenses, 21% had an archery licenses, and 16% had a bonus license.

Many hunters (60%) visited two or more different kinds of destinations on any one trip. Each destination had different land ownerships/site characteristics and therefore different travel times (and costs) were involved among destinations. About 38% of all trips included state game land, 34% private non-posted land, 21% private posted land, 19% state forest land, 15% state park land, 15% Allegheny National Forest land, and 10% others.

There are two assumptions one makes when using TCM: (1) trips are single-destination trips, and often the key to meeting this assumption is in choosing the geographic boundary of the relevant market of the recreational activity;

and (2) the cost of travel and travel time are incurred to gain access to the recreation site and that no benefits are received from the travel itself. However, these assumptions can be relaxed if the researcher assumes, as we did in our study and as recommended by Loomis and Walsh (1997), that: (1) the characteristics of the population are the same from one distant zone to the other; and (2) trips are of uniform duration and for the single purpose of visiting the recreation site. As a result, all hunter trips were assumed to be related to all hunting resources throughout one geographic region ... the Commonwealth of Pennsylvania. Consequently most of the variables in Equation 1 were not applicable for purposes of this study.

A similar approach was used by Upneja, Shafer, Seo, and Yoon (2001) and Shafer and Upneja (2002), in which they measured the economic value of sport fishing and angler wildlife watching in Pennsylvania. Many angler trips involved multiple destinations. The median number of days per trip was 2, and 76% of all trips were concentrated within 5 months of the year. At lease two factors may have contributed to the large number of multiple destination trips: the large size of the aquatic resource and the wide array of different kinds of sport fishing opportunities within that resource. In addition, there were 11 types of sport fishing regulations in effect on a variety of water bodies at the time of the study. As a result the average cost per angler trip, regardless of the specific type(s) of fishing that was involved on any one trip, was used to develop an annual demand curve for sport fishing resources throughout the state.

Hunters spent a total of approximately $1.20 billion on trip-related expenditures. Miscellaneous was the largest expenditure category involving 33% of the total. Food and beverage, and transportation costs accounted for 28% and 20%, respectively.

The TCM used to determine the value of the hunting resource involved two stages. In the first stage, ordinary least squares regression techniques (Ott 1988) were used on the sample data to estimate the relationship of a hunter's number of trips per year (Q) to a hunter's travel cost for the past trip (P). The equation obtained was

$$Q = 20.8 - 2.56\ (ln\ P) \qquad (2)$$

with an adjusted $R^2 = 11.3\%$

This equation indicated that total annual trips per hunter (Q) would decrease as total expenditures per trip (P) increased by 2.56 (*ln* P).

The average total out-of-pocket expenditures per hunter's trip was $174± a standard error of $7.70, and the average number of trips corresponding to that average expenditure per trip was 20.8 - 2.56 (*ln* 174) = 7.58 trips per year.

In the second stage of the TCM analysis, the first stage equation was used to estimate the number of hunter trips, with incremental prices starting from the current expenditure of each individual hunter and continuing until the estimated number of trips approached zero. The average consumer's surplus value was $840.17. The annual total value of the hunting resource was $6.39 billion. This was 4.8 times the total $1.31 billion out-of-pocket travel expenses hunters spent to use that resource (Table 1).

An annual demand curve for hunting resources summarizes the results of the above procedures (Figure 1).

Wildlife-Watching

About 43% of hunter households contained one or more members who took one or more trips during a 12-month period to watch, photograph wildlife, or observe evidence of wildlife activity in Pennsylvania, for a total of 3.4 million trips (Table 1). The median number of trips per year was four: 62% occurred throughout September, October, and November. The median number of wildlife watching trips was 4, and the median number of days per trip was 2. Large mammals, birds of field and forest, birds of prey, waterfowl, carnivores, and songbirds were the types of wildlife sought most often.

The TCM was also used to determine the value of hunter household nonresidential wildlife-watching resources. The first stage equation was

$$Q = 17.3 - 2.86(ln\ P) \qquad (3)$$

with an adjusted R^2 of 14.6%

With otherwise identical conditions, wildlife-watching trips would decrease as expenditures (P) increased by 2.86 (*ln* P).

The average total out-of-pocket expenditure for the 50 percent of all hunter households that took wildlife-watching trips was $33.57± a standard error of $4.30, and the average number of trips that corresponded to the average trip cost was 17.3 – 2.86 (*ln* 33.57) = 7.25 trips per year. Procedures used in the second stage of the TCM analysis paralleled those used above for determining the average consumer's surplus value for hunting resources. The average consumer's surplus value for hunter household nonresidential wildlife-watching resources was $143.27. The annual total value of nonresidential wildlife-viewing resource was $0.49 billion, 4.45 times the $0.11 billion that

hunter households spent to enjoy the amenity values of wildlife for a 12-month period (Table 1).

An annual demand curve for wildlife summarizes the results of the above procedure (Figure 2).

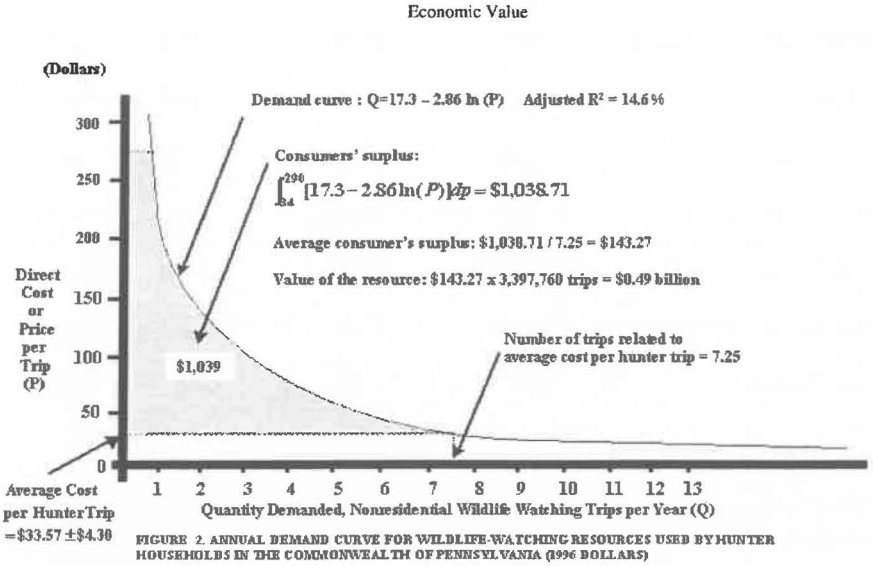

FIGURE 2. ANNUAL DEMAND CURVE FOR WILDLIFE-WATCHING RESOURCES USED BY HUNTER HOUSEHOLDS IN THE COMMONWEALTH OF PENNSYLVANIA (1996 DOLLARS)

Economic Impacts

Hunters spent a total of $421,314,960 for hunting equipment and miscellaneous related items. Considering the fact that there were 1.1 million licensed hunters, the average investment in equipment per year was approximately $420/hunter.

IMPLAN was used to measure the annual economic impact of hunting equipment purchases. The overall economic impact of all equipment expenditures was approximately $2.39 billion, 54% of which had a direct economic effect (Table 2).

Table 2. Economic Impacts of Hunting-related Equipment Purchases: millions (1996 dollars)

Economic Category	Direct Effect	Indirect Effect	Induced Effect	Total
Personal Income	$536	$154	$271	$961
Employee Compensation	$458	$129	$233	$820
Proprietary Income	$78	$25	$38	$141
Other Property Type Income	$130	$73	$126	$329
Induced Business Taxes	$77	$19	$40	$136
Total Economic Benefit (output)	$1,279	$400	$708	$2,387
Employment (jobs)	24,492	5,154	10,443	40,089
% of Dollars	54	16	30	100

Summary and Conclusion

Rosenberger and Loomis (2001) document 163 outdoor recreation studies for evaluating the reliability of consumer surplus values. Their consumer surplus values are reported in fourth quarter 1996 dollars, and expressed in terms of consumer surplus per activity day per person. An activity day is defined as the typical amount of time a person pursues a recreation activity within a 24-hour period.

In Appendix C, Table C of Rosenberger and Loomis (2001), there are ten big game hunting studies referenced for USDA Forest Service Region 9, which encompasses Pennsylvania and 19 other states in the northeastern US. Only two of those 10 studies reported TCM consumer surplus values for big game hunting in Region 9 (Fisher 1982, McCollum et al. 1988). Fisher (1982) provided broad regional zonal TCM models that had a consumer surplus value of $209.08 for big game hunting throughout Region 9, while McCollum, Bishop, and Walsh (1988) determined that the consumer surplus for big game hunting throughout Region 9 was as high as $100.99. Assuming that one day of hunting in our study was equivalent to one visitor day, our study's consumer surplus per visitor day would be $840/median of 3 days per trip = $280. This result seems reasonable since Pennsylvania, which ranks among the top three states in the nation in terms of number of license sales, would tend to be a statistical deviate and have a higher TCM consumer surplus value for big game hunting than most or any of the other 19 states in Region 9.

Rosenberger and Loomis (2001) did not report any TCM consumer surplus values for small game hunting or wildlife watching for Region 9. However, they did report the range of estimates throughout the nation for consumer surplus values of wildlife viewing to be $2.36 – $161.59. Assuming that one day of wildlife in our study was equivalent to one visitor day, our study's consumer surplus per visitor day is $143.22/median value of 2 days per trip = $71.63; or approximately the national median value for wildlife watching.

Some of the reported wildlife-watching activity may have involved preseason scouting of hunting sites. Such activity might be more appropriately classified as hunting activity, rather than nonconsumptive wildlife watching. However, respondents were not instructed on this distinction when reporting their activities.

Results of this research can help the Commonwealth's General Assembly and resource managers craft better policies and programs that relate to hunting and hunter household wildlife-watching activities. More specifically, research results can help link those activities to rural economic development strategies, including tourism, and help policy makers and resource managers make sure that the availability of wildlife resources and adjoining lands match the demand for those resources.

Study results are relevant to rural and natural environments throughout Pennsylvania, where resource managers are challenged continually with pressures from a wide range of different interest groups to allocate wildlife-related recreational opportunities for diverse and, at times, conflicting purposes.

Groups that will use the results of this research include government leaders, wildlife resource managers, industry, media, and others interested and active in wildlife resource management.

Economic data alone will never justify hunting or be the sole reason behind wildlife management issues and decisions (Westman 1985, Decker and Goff 1987). Instead, economic data generated by this research can be used with biological, public opinion, and cultural data to produce policy decisions that are sound and well informed.

Information from this research provides several basic benefits to the five types of information user groups described above. Study results help to provide insights on the importance of hunting and wildlife watching to the people who participate in these activities. This is fairly straightforward; hunters do not spend money on something they dislike and call it recreation (U.S. Department of Interior 1993). However, the results of the TCM and IMPLAN

models convey the value of the hunting resource and hunting's economic impacts for all members of society, not just those who hunt. Hunters' expenditures created many jobs and have financial impacts on the economy. More importantly, these impacts accrue not only to those in sporting goods stores but also to employees of the hotels and restaurants that cater to hunters, in the factories that produce the metals and plastics for hunters' equipment, and in the thousands of businesses that support these industries, including urban-based accounting and insurance firms, utilities, trucking, and so on (Maharaj and Carpenter 1996).

The study documents and helps to communicate the value of hunting resources and wildlife watching resources to those who normally are not concerned about those activities. Future decisions regarding hunting resources need to be made by people well informed about all of its aspects: biological, economic, social, and cultural. Economic information may be a key factor motivating their decisions. Not providing economic data to this type of person and everyone else involved in wildlife management may reduce the quality and support for hunting (Westman 1985).

Results provide natural resource management agencies with an understanding of the displacements that could be caused or benefits produced by changes in hunting seasons or related laws and regulations.

Survey information establishes an accurate database for wildlife management agencies to formulate strategic plans and programs that will result in optimum use and economic returns from the use of the natural resource involved.

However, the economic information about wildlife-associated recreation described in this study need to be viewed as only part of the total information package required in hunting and wildlife policy formulation and management (Decker and Goff 1987). Future research efforts need to examine how hunting's economic resource values and hunting's economic impacts can be integrated with estimates of the biological carrying capacity of wildlife habitats. The overriding factors in decisions aimed at long-term sustainable wildlife management are the limitations imposed by the ecosystem involved (Leopold 1933, Peck 1986, Russell 1987).

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An Analysis of Regional Disparity on Tourism Development in Guangdong

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Abstract: Guangdong is one of the most developed tourism provinces in China. But the development level varies from city to city. In order to disclose the regional disparity, an index System was established, and the methods of principle component analysis, hierarchical cluster were also used. It revealed that the scale of development and ability of organizing were the major factors of tourism development in Guangdong. Based on regional disparities, 21 cities of Guangdong province were divided into four groups, which were matured, market-styled, destination-styled and undeveloped region. Some suggestions were put forward accordingly.

Keywords: Guangdong province; tourism; principle component analysis; hierarchical cluster; regional disparities.

Introduction

The tourism in Guangdong is not only the major industry of local economy; it also plays a very important role in the tourism economy of China. In 2001, all the index of annual tourist arrivals, domestic tourists, international tourism receipts and total tourism receipts took the first place in the whole country. Total tourism receipts amounted to 126,083 million yuan and international tourism receipts reached $4,480 million, which weighed 25.2% of that of China [1]. In order to meet the challenges of economic globalization and the entering of World Trade Organization of China, a target of national travel plan and great tourism province was put forward in Guangdong. It's important to disclose the regional disparities of tourism development and make development strategy to local conditions to promote regional coordinated development.

Overview of Tourism Research in Guangdong

Some researches on tourism of Guangdong have been carried out [3,4, 5]. But the research of regional disparities of tourism in Guangdong is seldom involved. In 1996, Professor Li Jiangfan compared tourism of Guangdong with that of some other provinces and countries, cities within the province were also included. He divided the province into three groups by considering the proportion of tourism increase in local GDP, regions of higher level, which are

mainly in the Pearl River Delta, medium level, which refers to North Guangdong, and lower level, both the west and east part of Guangdong are included [6]. Based on tourism statistics of Guangdong in 2001, using the methods of multiple statistic analysis, we tried to carry out a further study on the problem of regional disparities of tourism development in Guangdong province.

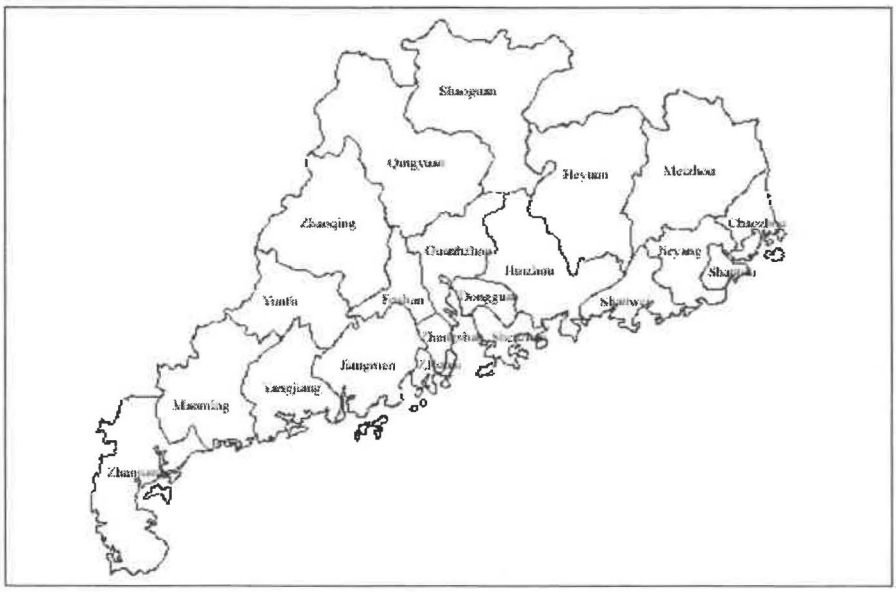

Fig. 1 Regions in Guangdong Province

Index System

As regional travel activity is synthetic, the index of regional tourism development should also be comprehensive enough to reflect the development status. Using Professor Michael E. Porter's four aspects of competitive advantage as a reference [8] and considering the statistics acquired, we chose 4 species, 15 indexes to build the index system, which include the scale of development, ability of traveling, organizing and receiving.

Methods of Analysis

Methods of Principle Component and Hierarchical Cluster were used to analysis the level of synthetic tourism development and regional disparities.

Synthetic Evaluation On Tourism Development

After standardize original data, we calculated with SPSS10.0, extracting components when cumulative sums of Squared Loadings excess 85%.