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Full Length Research Paper

Tourists' nationalities and the cost efficiency of international tourist hotels in Taiwan

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This paper analyzes the effects of tourist nationalities on the cost efficiency of international tourist hotels (ITHs) in Taiwan. From 1996 to 2007, the numbers of overseas Chinese and European tourists have shown significantly negative effects on cost efficiency, while the numbers of Taiwan Nationals, North American, Japanese, and Australian tourists have had significantly positive effects on cost efficiency. The numbers of the rest of Asia tourists (including mainland Chinese) have no significant effects on cost efficiency. Furthermore, the chain system and shorter distances to the nearest international airport significantly improve cost efficiencies.

Key words: Nationality sources, cost efficiency, international tourist hotels.

INTRODUCTION

Tourists' consumption is the main revenue stream of international tourist hotels (ITHs) and their quantity usually affects the operations of these hotels. However, tourists' nationalities also result in different operational performances. According to the report of Tourism 2020 Vision (United National World Tourism Organization (UNWTO, 2009), the global tourism market will grow from 1.006 billion in 2010 to 1.561 billion person-time in 2020, and tourism-related revenue will hit US$2 trillion. The Asia-Pacific market is forecasted to grow from 195 million in 2010 to 397 million person-visits in 2020. In Taiwan, overall tourism revenues have increased steadily. Foreign exchange income from tourism went from NT$158.5 billion in 2002 to NT$187.1 billion in 2008, but since 2002 Taiwan's tourism industry has remained at NT$200 billion. Taiwan is reaching the phase of maturity and growth appears limited. Therefore, developing international tourism and earning foreign exchange are important ways to enhance overall tourism income in Taiwan. At present, tourism has become the main source for many countries to earn foreign exchange and is important in the global economic development, but it is a complex industry. With the change of demands within Taiwan's tourism market, international tourist hotels have become one of the essential factors.

According to the statistics of the Tourism Bureau in Taiwan, from January to November 2009 the person-time amount for visitors in Taiwan reached 3,945,198, which is 12.94% higher than the same period of the previous last year. The number of tourists visiting Taiwan grew by 28.46%, hitting 2,031,637 person-time, which set a historical record, and accounted for 51% of the visitors to Taiwan. Most of the foreign visitors are from Asian countries, like mainland China, Japan, Hong Kong, and Macao. Indeed, the top five sources of foreign tourists are Hong Kong and Macao, Japan, Southeast Asia, the U.S. and Singapore. Most business travelers are from Japan, Southeast Asia, the U.S., mainland China and Hong Kong and Macao. To date, Taiwan has a total of 95 hotels, of which 65 are international tourist hotels and 34 are general tourist hotels. The occupancy rates of international tourist hotels in August 2009 were as follows: 71.66% in Taipei, 63.21% in Kaohsiung, 61.58% in Taichung, 66.16% in Hualien, and 51.59% in other areas. Therefore, international tourist hotels play critical roles in the domestic tourism and hotel industry (Tourism Bureau, 2009). However, our study is limited by the panel data's latest public year which is 2007, whereas mainland Chinese tourists are not separated from Asian tourists

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until 2007's report.

In 2008, visitors' average consumption during their stay in Taiwan was US$1,544, and their average daily consumption was US$211.46, of which the expenditure on hotels accounted for the most (44.74%), followed by shopping (23.02%) (Tourism Bureau, 2008). This indicates that international tourist hotels are the most significant beneficiaries from the development of the tourism industry. However, in a severely competitive environment, the hotel industry is encountering new impacts and challenges. Hotels should urgently enhance service quality and operational performance, construct unique images, strengthen service standards, and demonstrate their characteristics, styles, and multiple functions in order to satisfy the demands of customers from different backgrounds. Operational performance is closely associated with the sustainable development of hotels, and influences related industries. When facing industrial competition, hotels not only should effectively control costs for profits and growth, but also properly improve operational effectiveness. Therefore, how to enhance productivity and effectively using resources to achieve maximum efficiency is an important issue for hotel managers.

Literature review

The World Travel and Tourism Council (WTTC, 2007) indicated that the global tourism industry scale in 2000 was about 10.8% (US$3.58 trillion) of global GDP. It is estimated that by 2010, the global tourism industry scale will reach 11.6% (US$6.59 trillion) of global GDP. In 2000, there were 0.19 billion people working in the tourism industry around the world, and it is estimated to be 0.25 billion people by 2010. The tourism industry is important to both the job market and economic growth.

Past research studies on the evaluation of tourist hotels performances were mostly based on financial ratio analysis. Greenberg (1986) employed cost-volume analysis to probe the influence of capital in hotels and the change of sales on business revenues. Anderson et al. (1999b) analyzed the operational efficiency of 48 tourist hotels in the U.S. in 1994 by Stochastic Frontiers Analysis (SFA). The input variables included the number of employees, the number of rooms, casino and entertainment expenditures, and food expenditure and other expenditure, while the output variables included income of rooms, income of casino and entertainment, and income of food and others. The results showed that the average efficiency of 48 tourist hotels was up to 89.4%. Anderson et al. (1999a) studied the operational efficiency of 48 tourist hotels in the U.S. by Data Envelopment Analysis (DEA). The input variables included the number of full-time employees, the number of rooms, casino-related operation expenditure, and food expenditure and other expenditure, while the output variables included variables included total revenue. They found that the average efficiency of 48 hotels was 42%. In other words, in order to maintain efficient output, 58% of expenditure can be decreased.

Tsaur (2001) investigated 53 international tourist hotels in Taiwan in 1996-1998 by DEA and found that the average efficiency of these hotels was 87.33%. Hwang and Chang (2003) analyzed the efficiency of international tourist hotels in Taiwan and the change of efficiency in 1994-1998 by DEA. Their analysis was based on relative efficiency in 1998 and change of efficiency in 1994-1999 for 45 international tourist hotels. The study on the operational efficiency and progress of international tourist hotels found that the operational efficiency of international tourist hotels in Taiwan was significantly different according to types of market, customer source, and managerial models. Barros (2004) studied the operational performance of tourist hotels in Portugal and analyzed 43 tourist hotels in 2001 by DEA under 7 input variables and 3 output variables. The mean of overall technical efficiency scores was 91% and that of pure technical efficiency scores was 94.5%, indicating that most international tourist hotels in Taiwan are efficient.

Yang and Lu (2006) studied the relative performances of 56 international tourist hotels in Taiwan by DEA and found that the scale of returns for most of the hotels were low, mainly due to a severely competitive market. The relative efficiency of those international tourist hotels located in scenic areas was higher than those in cities. Moreover, the relative efficiency of international tourist hotels located near international airports was lower than those far from international airports. Through SFA, Chen (2007) probed the operational performance of 55 international tourist hotels in Taiwan in 2002 and included 3 input variables and total business income as the output variable. The results showed that the average efficiency of international tourist hotels was 80%. A comparison on the operational performances of chain and non-chain tourist hotels indicated that the efficiency of chain hotels was higher than ordinary independent international tourist hotels. Hu et al. (2010) simultaneously estimated cost efficiency scores and factor cost inefficiency of 66 international tourist hotels in Taiwan during 1997-2006 by one-stage SFA. They used 3 input variables, 3 output variables, and 5 environmental variables. The empirical results show that the average efficiency of international tourist hotels in Taiwan reached 91.15%. Moreover, chain international tourist hotels, guides, and distance from international airports showed significant influences on the operational performance of international tourist hotels.

Because of different market positioning, international tourist hotels in Taiwan have different customer sources. The studies on evaluating the performance in the hotel industry use various input and output items. Input items include labor, capital, materials and energy, number of employees, number of rooms, total square measure of

food department, and business expenditure, while output items include occupancy rate, food amount, total business income, room income, food income, other income, return on investment before tax, average actual room price received, average employee output of food department, international chain hotels, distance from international airports, and the construction of an evaluation model on hotel performance (Johnson and Ball, 1989; Hwang and Chang, 2003; Hu et al., 2010). As Table 1 shows, most studies tend to evaluate hotel performance by the financial ratio or operational data, and the findings are inconsistent. Moreover, there is a lack of studies on the number of foreign guests in hotels. Thus, this study aims to focus on the nationalities of guests in international tourist hotels and to probe into the influence of their nationalities on the overall technical and cost efficiency of international tourist hotels in Taiwan. This study also evaluates the operational efficiency of international tourist hotels by DEA, which analyzes issues upon multiple inputs and output efficiency in order to explore the relatively inefficient hotels and to serve as a reference for international tourist hotels.

METHODOLOGY AND DATA

Data envelopment analysis is a linear programming methodology to measure the efficiency of multiple decision-making units (DMUs) using multiple inputs and outputs. This methodology constructs the frontier in the same period. This paper defines the DMU as an international tourist hotel.

We choose to use the input-oriented method among DEA's various models. A more commonly spoken language is described as:

"By how much can input quantities be proportionally reduced without changing the output quantities produced?"

This study uses the following introduction of the models.

Assume that there are K inputs and M outputs for each of the N DMUs. The following is the linear program:

$$\underset{\lambda, x_i^*}{\text{Min}} \; w_i' x_i^*$$
$$\text{s.t.} \quad -q_i + Q\lambda \geq 0$$
$$x_i^* - X\lambda \geq 0$$
$$\lambda \geq 0, \qquad (1)$$

where q_i is a M×1 vector of output for the i-th DMU, x_i is a K×1 vector of input for the i-th DMU, Q is a M×N output matrix, X is a K×N input matrix, λ is a N×1 vector of constants representing the weight of each DMU, w_i is a vector of input prices for the i-th DMU, and x_i* is the cost-minimizing vector of input quantities for the i-th DMU, given the input prices w_i and the output levels q_i. The cost efficiency (CE) of the i-th DMU can be calculated from:

$$CE = w_i' x_i^* / w_i' x_i \qquad (2)$$

The value of CE is between zero and one. Here, CE = 1 presents that the firm is the cost efficient DMU.

Tobit analysis

Some environmental variables may affect the DMUs' efficiency. Therefore, whether these environmental variables will actually influence the efficiency among the DMUs plays a very important role in this study

Tobit censored regression analysis is a good tool to investigate whether these environment variables, natives, overseas Chinese, North American, Japanese, the rest of Asian, European, and Australian tourists have an effect on the inefficiency scores. We express the equation as follows:

$$Ineff\_i = \alpha + Z_i\beta + u_i = \text{ if } \alpha + Z_i\beta + u_i > 0 \qquad (3)$$
$$= 0 \quad \text{if } \alpha + Z_i\beta + u_i \leq 0$$
$$i = 1, 2, \ldots, N,$$

where N is the number of DMUs, Ineff_i presents cost inefficiency scores in this study, Z_i is the vector of dependent variables called environment variables, β is a vector of unknown parameters that we want to estimate, and u_i is the error term following a normal distribution with zero mean and constant variance.

Data sources and variable definitions

This study uses unbalanced panel data from the period 1997 to 2007. We collect all the tourism variables from the annual Operating Report of International Tourist Hotels in Taiwan published by the Taiwan Tourism Bureau. We choose all international tourist hotels with complete data in the report for each year. Therefore, the numbers of international tourist hotels varied every year as shown in Table 2. The numbers of observations from 1996 to 2007 are as follows: 1996 (49 DMUs), 1997 (51 DMUs), 1998 (52 DMUs), 1999 (54 DMUs), 2000 (54 DMUs), 2001 (54 DMUs), 2002 (55 DMUs), 2003 (57 DMUs), 2004 (57 DMUs), 2005 (56 DMUs), 2006 (57 DMUs), and 2007 (56 DMUs), making 652 observations in total.

Output variables

Total revenues of food and beverages (y_1): This include incomes from sale of food, snacks, alcohol, beverages in dining room, coffee room, banquet, and night club (tips are not included), measured in units of NT$.

Total revenues of rooms (y_2): This include incomes from lease of rooms (tips are not included), measured in units of NT$.

Other revenues (y_3): Incomes other than the two items mentioned above. They include operating revenues from lease of store space, laundry, swimming pool, ball courts, barber shop, beauty salons and bookstores, measured in units of NT$.

Input variables

Number of guest rooms (x_1): These include the amount of guest rooms that can be provided for rent by an international tourist hotel. Accordingly, the unit of measurement is simply "rooms", without subsequent adjustment being made for size or quality.

Number of employees (x_2): Total employees who are involved in the operation of international tourist hotels, including medium- and high-ranking executives, guest room and catering staff, cooks, maintenance crews, and repairmen.

Total floor space of catering division (x_3), including the total floor space used by the operational units of all hotels' catering facilities, measured in square feet.

Table 1. Literature of the hotel frontier efficiency.

Authors	Method	Units	Inputs	Outputs
Anderson et al. (1999)	SFA	48 U.S. hotels; 1994	The number of full-time equivalent employees; the number of rooms; total food and beverage expenses; total gaming-related expenses; other expenses.	Total revenue
Anderson et al. (2000)	DEA	48 U.S. hotels; 1994	The number of full-time equivalent employees; the number of rooms; total food and beverage expenses; total gaming-related expenses; total hotel expenses; other expenses.	Total revenue
Tsaur (2001)	DEA	53 Taiwan hotels, 1996–1998	Total operating expenses; number of employees; number of guest rooms; total floor space of the catering division; number of employees in room division; number of employees in catering division; catering cost.	Total operating revenues; number of rooms occupied; average daily rate; average production value per employee in the catering division; total operating revenues of the room division; total operating revenues of the catering division
Hwang and Chang (2002)	DEA	45 Taiwan hotels; 1998	Number of employees; number of guest rooms; total floor space of the catering division; operational costs.	Room revenue; food and beverages revenue; other Revenues
Hwang and Chang (2003)	DEA	45 Taiwan hotels; 1994– 1998	Number of full-time employees; guest rooms; total area of meal department; operating expenses.	Room revenue; food and beverages revenue; other revenues
Barros (2004)	DEA	43 Pousada, hotels; 2001	Full-time workers; cost of labor; rooms; surface area of the hotel; book value of property; operational costs; external costs.	Sales; number of guests; nights spent
Yang and Lu (2006)	DEA	56 Taiwan hotels; 2002	Total operating expenses; number of employees; number of guest rooms; total area of catering division.	Total operating revenues; average occupancy rate; average room rate; average production; value per employee in the catering division; average production value of catering division.
Chen (2007)	SFA	55 Taiwan hotels; 2002	Cost of labor; total food and beverage expenses; materials costs	Total revenue.
Hu et al. (2009)	DEA	66 Taiwan hotels; 1997~2006	Number of employees; number of guest rooms; total floor space of the catering division.	Room revenue; food and beverages revenue; other revenues
Hu et al. (2010)	SFA	66 Taiwan, hotels; 1997~2006	Number of employees; number of guest rooms; total floor space of the catering division.	Room revenue; food and beverages revenue; other revenues

Table 2. Descriptive statistics of outputs, inputs, and input prices (Units = NT$).

Variable	Mean	Standard deviation	Minimum	Maximum
Total revenues of food and beverages (y_1)	268,211,000	274,056,000	4,947,276	1,317,330,000
Total revenues of rooms (y_2)	223,630,000	205,686,000	7,044,733	1,389,700,000
Other revenues (y_3)	95,046,800	129,901,000	0	702,396,000
Number of guest rooms (x_1)	73,066	45,100	3,910	259,857
Number of employees (x_2)	348	246	32	1,266
Total floor space of catering division (x_3)	1,205	1,311	48	12,037
Average price of room operations (w_1)	2,852	1,200	816	8,908
Average employee annual wage (w_2)	490,032	145,573	82,715	903,692
Average price of F and B operations (w_3)	101,301	95,785	2,276	1,887,736

Input prices

Average price of room operations (w_1): This refers to the total operating expenses per room, measured in NT$/room. We use the total revenue of a hotel divided by the number of rooms.

Average employee annual wage (w_2): This include salary and related expenses per employee, measured in NT$/individual.

Average price of F&B operations (w_3): This refer to catering department expenses per square meter of floor space, measured in NT$/square meter.

Environmental variables

Number of tourists by nationally: The numbers of natives, overseas Chinese, North American, Japanese, Asian, European and Australian tourists.

Chain: "0" represents independent management and "1" represents hotels joining an international chain.

Distance to airport: "0" represent the distance between hotels to the nearest Taiwan international airport being less than 70 km, and "1" means farther than 70 km.

Year: 1996 is year 1 and 1997 is year 2, and so on.

Because the actual value of the average price of operations was not reported in the annual report, we use the total operating expenses per room as the average price of room operations. This is a limitation of the study. The nominal variables have been transformed into real variables in 2001 prices, using GDP deflators. The price unit of outputs and inputs is NT$.

EMPIRICAL RESULTs AND DISCUSSION

Descriptive statistics

Table 2 provides descriptive statistics for all the variables in the model. The average value of the total revenues of food and beverages (y1) is NT$268,211,000, the total revenues from room rental (y2) are NT$223,630,000 and other revenues (y3) are NT$95,046,800 during the past ten years 1996-2007. Standard deviations of outputs are quite large due to different sizes of these international tourist hotels.

Cost efficiencies

By using the Deap 2.1 software kindly provided by Professor Tim Coelli, we computed the cost efficiency scores of each DMU from 1996 to 2007. Figure 1 is the trend chart from the average value of each year.

From the operating report, we find some hotels were closed and some hotels were opened in some years or during some time period. For example, DMU 33 located in Taichung, has no data after 2004 and its technical efficiency and cost efficiency are the poorest among all DMUs. The total streamlining to this hotel in 1996 is: guest rooms could be reduced from 18193 to 4593 for a 74.8% reduction, employees could be reduced from 90 to 25 for a 72% reduction, and total floor space of the catering division could be reduced from 140 to 26 for a 81.2% reduction. Nevertheless, we suggest managers to not just use these numbers as their simple strategy, but to conduct a deeper study on how to improve efficiency. Figure 1 shows that the average cost efficiency slowly decreases from 2002 to 2005.

We convert the cost efficiency into cost inefficiency as cost inefficiency = 1/(cost efficiency) – 1. Table 3 lists the Tobit regression results on cost inefficiency and shows that numbers of natives, North American, Japanese and Australian tourists will increase cost efficiency of ITHs in Taiwan. The numbers of overseas Chinese and European tourists will decrease cost efficiency. The number of Asian tourists has no significant effects on cost efficiency. Since May 2008, the government in Taiwan has emphasized attracting mainland Chinese tourists in order to promote international hotels, but there is no significant result so far to support this hypothesis. The results are shown in Table 3. Australian tourists are the group with the highest operational efficiency, followed by native tourists and those from North America and Japan. The chain store system significantly increases the ITHs'

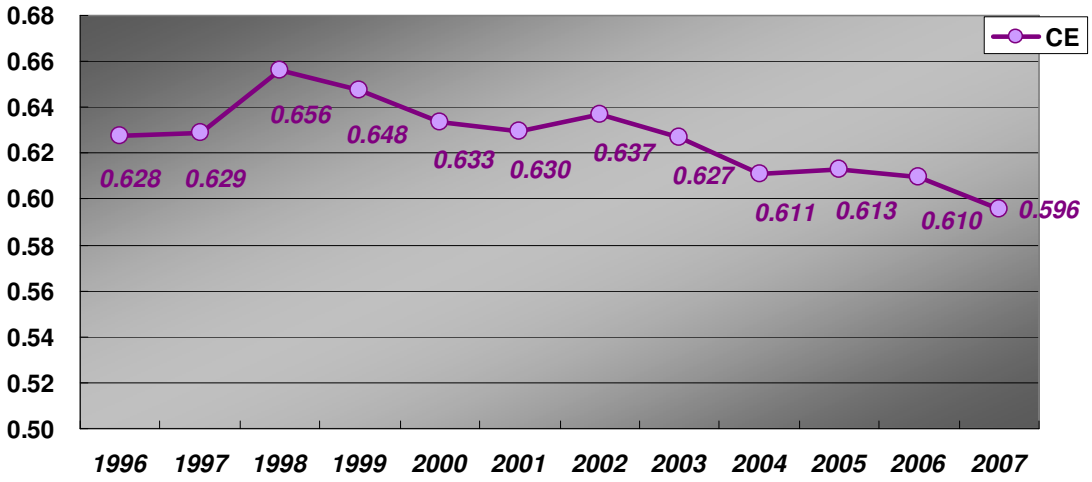

Figure 1. Trends of international tourist hotel cost efficiency scores in Taiwan (1996-2007).

Table 3. Results of Tobit regression on cost inefficiency.

Variable	Estimate	t-value	P-value
Constant	0.91599	15.9224	<.001***
Native	-2.15E-06	-3.65384	<.001***
Overseas	1.76E-05	5.5152	<.001***
North America	-2.10E-05	-4.96209	<.001***
Japan	-3.33E-06	-3.36979	**.001*** **
Rest of Asia	2.29E-06	1.11457	.265
Europe	1.59E-05	1.88899	.059*
Australia	-8.01E-05	-2.39247	.017**
Chain	-0.42144	-8.77424	<.001***
Distance to Nearest International Airport	0.17472	2.82729	**.005*** **
Year	0.01446	2.10097	.036**

Note: Notations ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

cost efficiency. Shorter distances from hotel to the international airport will increase cost efficiency.

Moreover, the ITHs' cost efficiency gradually went down from 1996 to 2007. Note that the numbers of natives and Japanese tourists significantly improved the efficiency. The Japanese tourist numbers significantly fell in 2003 due to SARS. However, native tourists increased in the same year. The increase in native tourists alone still cannot pull up the ITHs' cost efficiency.

CONCLUDING REMARKS

The major findings of this paper are as follows. During 1996 to 2007 the numbers of overseas Chinese and European tourists significantly worsened cost efficiency, while the numbers of natives, North American, Japanese, and Australian tourists significantly improved cost efficiency. With regard to the rest of Asian tourists, there is no significant relationship with cost efficiencies. The chain system and a shorter distance to the nearest international airport will both improve cost efficiency. The ITHs in Taiwan have become more cost-inefficient during 1996 to 2007.

Due to the slowdowns and recessions in Taiwan's economic development over the past ten years, cost efficiency has become a major concern for international tourist hotels to sustain their operations. This study finds significantly positive effects on cost efficiency by increasing tourists from Taiwan, North America, Japan, and Australia. Therefore, service design and marketing strategies can be targeted at tourists from these sources in order to promote Taiwan ITHs' cost efficiency. According to the Yearbook of the Tourism Bureau of Taiwan (2010), except for 2003 and 2004, when SARS had the most impact, Japanese tourists accounted for

over 30% among all inbound tourists, and 40% amonginbound tourists from Asian regions (except for 2003), indicating that Japanese tourists are very important to the tourism market of Taiwan. On average, Japanese tourists spend $264.83 USD per person per day. Among their consumption items, their spending habits inside the hotel, dining, domestic transportation, entertainment, and shopping expenses are all higher than those for tourists from other regions, making it obvious that they make the greatest contribution, with the strongest consumption power among tourists of the Asian region. Among their spending habits in Taiwan, hotels account for the greatest amount (41.8%, $110.79 USD), followed by shopping (24.7%, $65.44 USD), dining (12.8%, $33.77 USD), entertainment (9.5%, $25.22 USD), domestic transportation (12.8%, $23.69 USD), and miscellaneous items (2.2%, $5.92 USD).

Regardless of age or gender, all Japanese tourists are very interested in hot springs. Taiwan has abundant hot spring resources, and thus, should aggressively promote tourism products centered on hot springs. The ITHs should continue to provide high quality accommodation environments of specialized tourism packages, designed according to the age and gender of the tourists, in order to give Japanese tourists a good impression of Taiwan. Japanese tourists remain the main target of tourism development in Taiwan, as they can bring better economic benefits. Moreover, the chain system significantly improves cost efficiency. Small and medium-sized ITHs can hence earn network effects, marketing benefits, joint promotion, quality management, and brand values by joining chain systems.

In summary, innovative strategies must be adopted for tourists of nationalities with high cost efficiency, as well as tourists of nationalities with the potential of high cost efficiency. International tourist hotels that have average or poor cost efficiency should engage in strategic alliances or cross-industry alliances in order to enhance operational scale and performance. Since this study focuses on analyzing the nationalities of tourists, the operational scale and performance of hotels are very important.

The 2010 Taipei International Flora Exposition will be held from November 2010 to April 2011. This will definitely attract plenty of Japan tourists to visit Taiwan. As for native tourists, more of them will increase ITHs' cost efficiency. This is also necessary for Taiwan ITHs because the average occupancy rate is not always 100%. Joining a worldwide chain system will increase an ITH's exposure to global tourists. Future studies may conduct an accurate analysis on mainland Chinese tourists after new panel data are published with separate mainland China tourist numbers.

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REFERENCES

Anderson RI, Fish M, Xia Y, Mixhello, F (1999a). Measuring efficiency in the hotel industry: a stochastic approach. Int. J. Hospitality Manage., 18: 45–57.

Anderson RI, Lewis D, Parker ME (1999b). Another look at the efficiency of corporate travel management departments. J. Travel Res., 37: 267–272.

Barros CP (2004). A stochastic cost frontier in the Portuguese hotel industry. Tourism Econ., 10: 177–192.

Chen CF (2007). Applying the stochastic frontier approach to measure hotel managerial efficiency in Taiwan. Tourism Manage., 28: 696–702.

Coelli T (1996). A Guide to FRONTIER Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation, CEPA Working Paper 96/7, Department of Econometrics, University of New England, Armidale, Australia.

Hwang SN, Chang TY (2003). Using data envelopment analysis to measure hotel managerial efficiency change in Taiwan. Tourism Manage., 24: 357-369.

Hu JL, Chiu CN, Shieh HS, Huang CH (2010). A stochastic cost efficiency analysis of international tourist hotels in Taiwan. Int. J. Hospitality Manage., 29: 99-107.

Hu JL, Shieh HS, Huang CH, Chiu CN (2009). Cost efficiency of international tourist hotels in Taiwan: A data envelopment analysis application. Asia Pacific J. Tourism Res., 14: 371-384.

Johnson K, Ball S (1989). Productivity Measurement in Hotels. Tourism Marketing and Management Handbook. NJ: Prentice - Hall, Englewood, 319-323.

Tourism Bureau of Taiwan (2010). Website: http://admin.taiwan.net.tw.

Tsaur SH (2001). The operating efficiency of international tourist hotels in Taiwan. Asia Pacific J. Tourism Res., 6: 73–81.

World Tourism Organization (UNWTO) (2008), Retrieved October 26, 2008, from http://www.worldtourism.org

Yang C, Lu WM (2006). Performance benchmarking for Taiwan's international tourist hotels. Inf. Syst. Oper. Res., 44: 229–245.