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To Participate or Not to Participate in Medical Tourism:

A Study of the Hospitals in Taiwan

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Contents

Abstract	3
I. Introduction	4
I.) Motivation	4
II.) Research questions	4
III.) Research objectives	5
II. Literature Review	6
I.) Definition of medical tourism	6
II.) The world and Asian perspectives	6
III.) Taiwan's perspective	8
IV.) The role of hospitals in medical tourism	9
V.) Successful examples in Asia	10
VI.) Differences in the performance of hospitals and medical tourism	11
III. Methodology	13
I.) Data sources	13
II.) Data analysis- Discriminant analysis	15
IV. Research Findings	17
I.) Analysis I	17
II.) Analysis II	22
III.) Analysis III	24
V. Conclusion	31
VI. References	33

Abstract

Medical tourism is a thriving industry all around the world. Taiwan is developing its own medical tourism with its advantages in position and technology. Our object is to find out whether or not a hospital is qualified to be involved in medical tourism, and to offer suggestions for the hospitals as well.

We consulted the relevant literature, then we did discriminant analysis as well as the hypothesis test to analyze our secondary data from three aspects- whether the hospital participates in medical tourism; the hospital is excellent or premium; and the matrix of both analyses.

We found that four variables have negative effects on the hospital's decision whether to be involved in medical tourism: number of hospital beds, the daily number of outpatient visits, the daily number of inpatients, and bed occupancy rate. The reason may be that the hospital has sufficient financial resources; however, some of these may still develop medical tourism due to the government's policy. The variables with positive effects are the number of departments in a hospital and the amount of comprehensive medical personnel. The more resources a hospital get the more opportunities it has to improve its performance.

I. Introduction

I.) Motivation

In the 21st century, medical tourism has become a thriving industry all over the world, especially in Asia. With the rise in money people have to spend on medical care and the convenience of transportation we enjoy nowadays, people have great interest in medical tourism. Our study focuses on medical tourism in Taiwan, because there is great potential in receiving benefits from medical tourism in Taiwan. Taiwan has advantages in its position and medical technology, which provide travelers convenience to visit and confidence in medical care. The motivation for this research is based on two premises. Firstly, countries can receive great benefits from medical tourism. Secondly, although there are many studies on medical tourism, few studies concern the behavior of hospitals.

II.) Research questions

i.) What characteristics of a hospital can affect its decision on developing medical tourism?

Does a hospital with more patients and doctors tend to develop medical tourism?
Does a hospital provide medical tourism because it is lack of financial resources? We want to examine the reason for medical tourism by hospital's performance.

ii.) What are the requirements for a hospital to have high accreditation level and also provide medical tourism?

In our presumption, every hospital is working hard to make itself suitable for medical tourism as well as high accreditation level. Hence, we want to know what characteristics those well-performed hospital with medical tourism have. In order to give suggestions to those hospitals that try to enhance themselves.

iii.) Research method

In order to solve these questions, we use discriminant analysis as our analysis method. By this method, we can find out the variables which have the best discriminant ability to the different groups those hospitals in.

III.) Research objectives

The prior objective of this research is to find out the circumstances under which a hospital decides to be involved in medical tourism, the consideration a hospital takes and the possible effects of its own characteristic.

The other objective is that since the government has been trying hard to promote medical tourism; it will be more convincing for government to offer constructive suggestions for better development in this industry.

II. Literature Review

I.) Definition of medical tourism

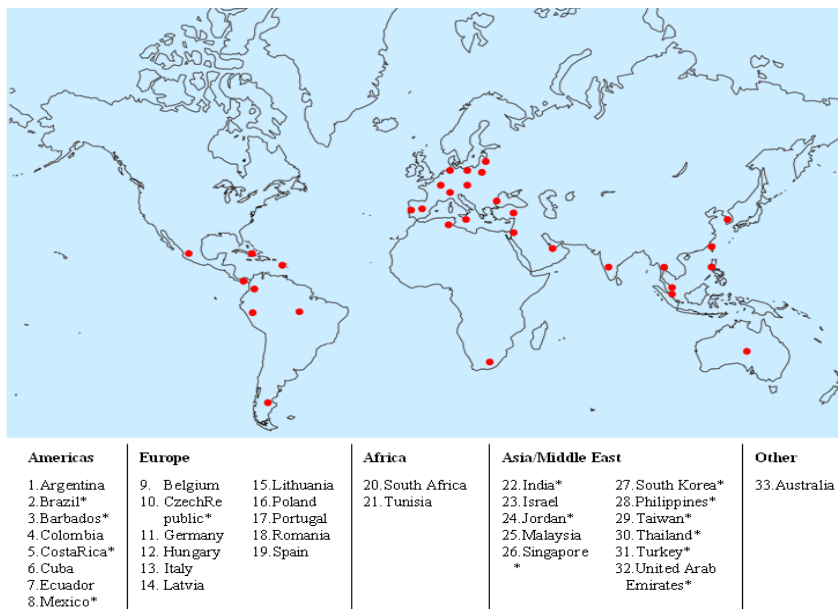
Although there are plenty of definitions of medical tourism, it can broadly be defined as people traveling from their place of residence for health reasons (Ross, 2001). IOUTO (International Union of Official Travel Organization) released the first official definition in 1973 : Health facilities which are produced by providing national resources can be defined as medical tourism, especially mineral springs and climate (Hall, 1992). World Tourism Organization defined medical tourism as a tour service which views health care, diseases, health and rehabilitation as theme, medical tourism includes both wellness tourism and medical travel. The former focuses on travel and the latter pays attention on medical treatment (Bishop – Litch, 2000). Our Department of Health also demonstrates that for whatever kind of tour whose purpose is to improve or stimulate health, or the tours that for accepting lower-cost medical behaviors on their own expense all can be described as medical tourism (Tsai, 2007).

II.) The world and Asian perspectives

Medical tourism is an emerging tourist industry in the world (see Figure 1). Traditionally, people travel to developed countries for medical treatments that are unavailable or illegal in their own country. Nowadays there is a new trend that people from the developed countries try to seek and receive medical care in developing

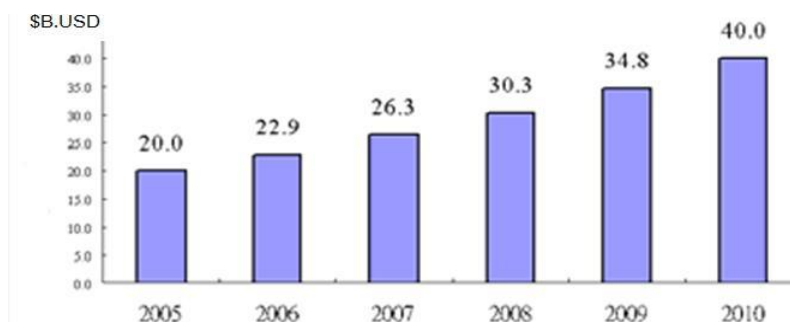
countries rather than in their own country. This is driven by the high cost, long waiting lists and lack of insurance in those developed countries such as U.S. and Europe. In the beginning, medical tourism mainly focuses on dental treatment and cosmetic surgery. However, it has grown and diversified to be value at US\$60 billion worldwide in 2006 recently. This fast-growing industry is estimated will grow to about US\$100 billion by 2012 (see Figure 2).

Figure 1: Medical Tourism Destinations



(Source: Wang, 2007. Industrial Technology Research Institute of Taiwan, R.O.C IEK-ITIS Plan)

Figure 2: Worldwide- Forecast for Medical Tourism Industry (in \$B. USD), 2005-2010



(Source: Wang, 2007. Industrial Technology Research Institute of Taiwan, R.O.C IEK-ITIS Plan)

In Asia, medical costs are reasonable and advanced medical services can be acquired because doctors are highly trained and have degrees from prestigious universities in western countries. In other words, people from western countries can receive similar level medical service as in their own countries but at a lower price. This is especially evident in Thailand, Singapore, India, South Korea, and Malaysia which attract almost 1.3 million medical tourists per year from around the world. Asia will account for at least US\$4 billion of estimated medical tourism value by 2012.

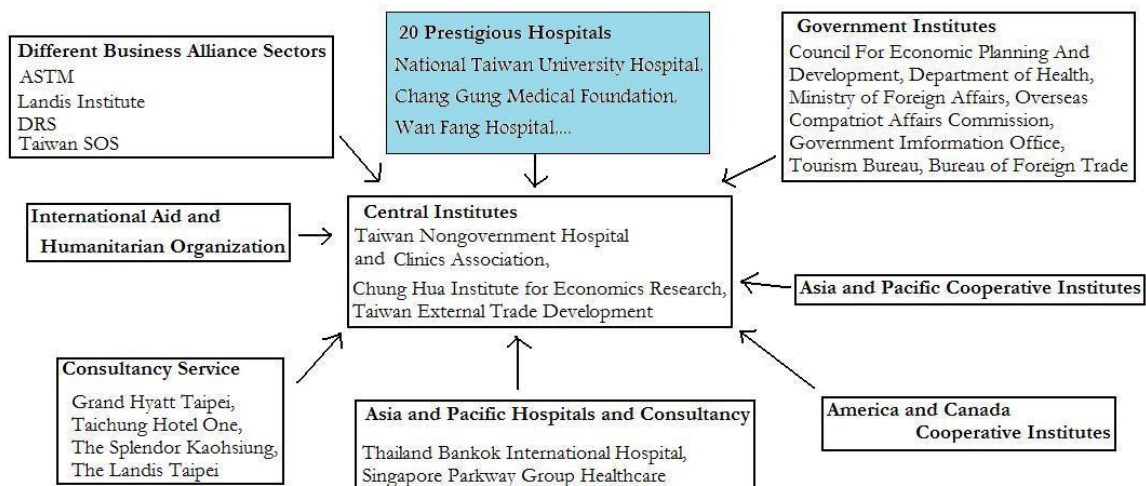
III.) Taiwan's perspective

Taiwan has the potential to provide medical services because of the great economic condition and development of its medical industry. Taiwan provides high quality services at affordable charges, advanced and complete medical resources in all technologies, equipment and so on. Especially for Chinese customers living overseas or from Mainland China, medical tourism can be more convenient due to the similar culture and language.

Therefore, the Taiwan government is striving to internationalize Taiwan's medical service. Most significant is that in 2007 the medical care industry was one of the four planks of the Industrial Development Package under the First-Stage Three-Year Spring Program of the Economic Development Vision for 2015. This plan is operated by a team consisting of the Taiwan Nongovernment Hospital and

Clinics Association, Chung Hua Institute for Economics Research, Taiwan External Trade Development and 20 prestigious hospitals in Taiwan. The purpose of the plan is to promote Taiwan’s medical services, attracting Chinese medical tourists from around the world and white-collar workers from neighboring countries. The most relevant part of the plan to our research is the 20 hospitals which intended to implement the plan (see Figure 3).

Figure 3: Internationalization of Taiwan Medical Service Platinum



(Source: Wu, 2008)

IV.) The role of hospitals in medical tourism

There are four factors determining the choice of destination for medical tourists — medical service quality, hotel / F&B quality, tourism support, and governmental legal & federal policies. (Dan Cormany. 2008. “Medical Tourism: Progress and Prospects.” *Medical Tourism*, 7.)

Hospitals are the main provider of medical services, which is one of the four

components that decides how a medical tourist chooses their travel destination. They will choose countries in which hospitals can ensure medical quality by well-trained doctors as well as advanced medical technology. Therefore we conclude that hospitals do play an important role in a country's medical tourism development.

As for Taiwan, we have an advantageous position for medical services.

We have medical technology that meets the standard of advanced countries like U.S., Europe and Japan. We conclude this by the fact that Taiwan is one of the leading centers for liver transplantation, knee replacement, and plastic surgery. Additionally, we have the traditional Chinese medicine which can broaden our medical services items. Hence, the role of hospitals is vital in development of medical tourism in Taiwan.

V.) Successful examples in Asia

The following are some successful examples in Asia. Thailand's Bumrungrad Hospital is a well known hospital which is a big success in medical tourism. It cooperates with the government's policies so well that it obtained the first JCI accreditation in Asia (Kao, 2007). Bumrungrad concentrates on meeting customers' needs and even provides translations in 26 languages. Besides, it also collaborates with Diethelm travel agent and Cathay Pacific to offer more complete services to customers and with the progress of the Internet, the number of patients has risen over

ten times in Bumrungrad in the past five years.

Among Asian countries, Singapore is another country with prosperous medical tourism. Owing to its early development and impetus from the government, medical tourism in Singapore is highly developed (Guo, 2007). According to an investigation by Political and Economic Risk Consultancy in 2003, the medical care system in Singapore is the third in the world. Parkway Holding Limited has founded medical referral centers in 44 countries around the world and is one of the best hospitals in Singapore. Additionally, Parkway Holding Limited emphasizes different kinds of service centers. The Singapore Tourism Board estimates that health visitors will reach more than 1 million by 2012 if growth rates continue to increase steadily.

Obviously, these two countries mentioned above are undergoing a blooming stage in medical tourism. Taiwan's hospitals can follow their examples to create a new era of medical tourism here.

VI.) Differences in the performance of hospitals and medical tourism

The purpose of our study is to discover the differences between hospitals that develop medical tourism and those that do not. To highlight their differences, we evaluate their performance with the following variables. The number of hospital beds indicates that the hospital with beds will be more willing to develop multiple

businesses (Zhang, 1991). The amount of comprehensive medical personnel can affect the hospital's financial management. By providing a sufficient amount, it can increase the total performance of the hospital. (Huang, 2004) The number of hospital departments has a positive effect on medical services (Hu, 2009). The bed occupancy rate can measure the hospital's productivity (Xu - Xue, 2001). The number of doctors can increase the demand for medical services in a region. (Chiu, 2006) As for average length of stay (ALOS), it is said that a hospital with a higher accreditation level will have longer ALOS and the hospital will also use more resources.

III. Methodology

I.) Data sources

We collect our secondary data from these three websites: Taiwan Task Force for Medical Travel, the Department of health, Executive Yuan, R.O.C. (Taiwan), and the Department of Health's Geographic informational system (GIS). From the first website, we know there are 30 hospitals participating in medical tourism since 2007 until now, and they are all evaluated in premium or excellent in the rating system of the Department of health. The rating system of the Department of Health evaluates the hospitals into three classes: premium, excellent, and qualified. Because all the 30 hospitals are either premium or excellent, we choose 110 hospitals from level premium and excellent, including 30 hospitals which participate in medical tourism and the other 80 hospitals which do not.

After choosing our hospitals, we have to collect the data of the hospitals' basic characteristics as our independent variables. The data period we choose is 2009, and we choose eight characteristics of hospitals as the independent variables. The items and their definitions are as follow:

i. Daily number of outpatient visits: Refer to the daily number of visits to the hospital or clinic and used medical record after registration.

ii. Daily number of inpatients: Refer to the daily number of patients handling the procedure of staying in hospitals.

iii. The average length of stay:

$$\text{Average length of stay} = \frac{\text{Total length of stay}}{\text{Total hospital stays}}$$

iv. Bed occupancy rate:

$$\text{Bed occupancy rate} = \frac{\text{Current year total hospitalization man - days} / 365 \text{ days}}{\text{Yearend current beds}} \times 100$$

v. The amount of departments in a hospital: Total number of departments offering medical service in a hospital.

vi. Number of hospital beds: Total number of hospital beds, including acute beds, chronic beds, psychiatric beds, T. B. Beds, leprosy beds, intensive care beds, hospice palliative care beds, infant care beds, nursery beds, psychiatric and other custodial beds.

vii. The number of doctors: Total number of doctors, including physician, doctor of Chinese medicine, and dentist.

viii. The amount of comprehensive medical personnel: Total number of medical personnel, including pharmacist, medical technologist, registered professional nurse, dietitian, registered nurse, midwife, registered professional midwife, pharmacist assistant, medical technologist assistant, dental assistant, medical radiation technologist, and medical radiological technician.

Then we set the dependent variable as categorization of hospitals to classify those hospitals into different groups. We will build up the model from these data.

II.) Data analysis- Discriminant analysis

We would like to understand why the 30 hospitals can participate in the medical tourism but the other 80 hospitals cannot even if they are all evaluated as premium or excellent, we try to find out whether they perform differently in some characteristics we choose. If they perform differently in these eight characteristics, we can conclude that the eight characteristics have enough abilities to distinguish the hospitals into two groups: participate or not participate in medical tourism.

Therefore, we will use the discriminant analysis method in the statistic software SPSS to achieve our research objectives. Before using SPSS, we have to classify all the hospitals into some groups, which are their original groups. The discriminant analysis is used to test whether these eight independent variables can properly discriminate all the hospitals we choose into their original groups. In our first analysis, we classify all the hospitals into two groups: not participate or participate in medical tourism. In the second analysis, we classify all the hospitals into excellent or premium. And in the third analysis, we classify all the hospitals into four groups: first, not participate and excellent; second, not participate and premium; third, participate and excellent, or fourth, participate and premium.

Next, we will do a hypothesis test and examine whether each independent variable can explain the dependent variable. We make a hypothesis: The group means are different, and we set the level of significance α equals .05. Then we will use F-test and p-value to make a decision. If the p-value is less than α for any variable, we can accept this hypothesis, and conclude that the variable has enough discriminant ability, so that we must keep it.

According to the coefficient's positive or negative sign of each significant independent variable, we try to find out how they affect the process of classification, and infer the causes behind them.

Finally, we can check how good these variables' discriminant abilities are by calculating the hit ratio. The hit ratio means the probability of correctly classifying with these variables. If the hit ratio is high enough, we can conclude that the variables have good abilities to classify those hospitals. Therefore, we can observe those variables' different performance in different groups, and generalize their characteristics in different groups.

IV. Research Findings

By running the statistic software SPSS to do the discriminant analysis, we got the data results and begin our analyses as follow.

I.) Analysis I

In the first analysis, we want to discriminate whether the hospital participates in medical tourism or not, and does it correspond to the reality. First, in the tests of equality of group means, we choose six significant variables in italic type: daily number of outpatient visits, daily number of inpatients, bed occupancy rate, number of departments in a hospital, number of hospital beds, and amount of comprehensive medical personnel (see Table 1). Their P values are all less than the α value, .05, by which we can effectively classify the hospitals to the appropriate groups.

Table 1: Tests of Equality of Group Means of Analysis I

Variables	F	Sig.
<i>Daily number of outpatient visits</i>	16.702	.000
<i>Daily number of inpatients</i>	14.207	.000
Average length of stay	1.094	.355
<i>Bed occupancy rate</i>	3.476	.019
<i>Number of departments in a hospital</i>	11.941	.000
<i>Number of Hospital beds</i>	13.494	.000
Number of doctors	.603	.614
<i>Amount of comprehensive medical personnel</i>	20.073	.000

Then, observing the standardized canonical discriminant function coefficients (see Table 2), we find out there are four variables (daily number of outpatient visits,

daily number of inpatients, bed occupancy rate, and number of hospital beds) which are negatively related to a hospital's decision of developing medical tourism. The two variables (the number of departments in a hospital and the amount of comprehensive medical personnel) are positively related, and the other two (average length of stay and the number of doctors) have no relation to its decision. The following part is the explanation to the result.

Table 2: Standardized Canonical Discriminant Function Coefficients of Analysis I

Variables	Function
Daily number of outpatient visits	-.093
Daily number of inpatients	-.210
Average length of stay	.196
Bed occupancy rate	-.360
Number of departments in a hospital	.457
Number of Hospital beds	-2.303
Number of doctors	-.259
Amount of comprehensive medical personnel	3.307

i.) Number of hospital beds

Our study indicates that the number of hospital beds can be a measurement of a hospital's scale (Fan, 2005). That is to say, a hospital with a larger scale usually has more beds. Moreover, if a hospital has a larger scale, it has more ability to provide diversified medical care and advanced medical technology. Nevertheless, a question arises from our analysis: Why does a hospital with more hospital beds tend not to develop medical tourism? We infer that a large-scale hospital already has sufficient

financial resources, so it does not need other businesses like medical tourism to increase its revenue. The reason large hospitals still provide medical tourism may be required by the government, or it may be that they have more resources and the required technology for medical tourism.

ii.) Daily number of outpatient visits; daily number of inpatients; bed occupancy rate

We explain these three variables together because they are all measurements of a hospital's productivity, so they may represent the same aspect of a hospital. We infer that a hospital with a large daily number of outpatient visits, daily number of inpatients, and bed occupancy rate has already reached its goal of expected profits. On the other hand, these three variables may use up the limited resources a hospital has. Hence a hospital will not have enough resources for medical tourism.

iii.) The number of departments in a hospital

From a discriminant analysis of whether a hospital is involved in medical tourism, we see that the number of departments in a hospital has a strong correlation with a hospital's decision. Furthermore, hospitals with more departments have greater inclination to participate in medical tourism. The medical care one can receive from medical tourism ranges wildly from cosmetic surgery to internal examination, so different departments may be involved in this industry. As a result, we suppose that

the number of departments represents how many resources a hospital has available to develop medical tourism. Our inferences to the reason the number of departments increases the possibility of a hospital being involved in medical tourism are stated below. Firstly, if a hospital has various departments which can offer different kinds of medical care, it has a higher potential to offer suitable medical care for medical tourism. Secondly, more departments in a hospital means more resources in terms of technologies, facilities, and specialized doctors which enhance its ability to participate in medical tourism.

iv.) The amount of comprehensive medical personnel

Regarding comprehensive medical personnel, it is one of the two factors that has a positive influence on determining whether to become involved in medical tourism or not. According to discriminant analysis, we indicate that the larger amount of comprehensive medical personnel a hospital has the higher the possibility of it developing medical tourism. If a hospital has the intention to develop medical tourism, it means it should provide more services than those who do not wish to develop.

Additionally, to give patients a better medical environment, not only the number of doctor has to be sufficient, so to do the number of comprehensive medical personnel.

If a hospital has sufficient amount of comprehensive medical personnel, we can conclude that it has more human resources to support medical tourism and will not

suffer from a lack of medical personnel. Moreover, every patient may obtain more service choice. Based on this thesis (Huang, 2004), a sufficient amount of comprehensive medical personnel can improve a hospital's performance.

v.) The average length of stay

The definition of the average length of stay is total inpatient days divided by the total number of inpatients. We cannot make any interpretation merely based on this definition. For instance, we do not know the reasons for staying in a hospital, or what medical resources the patients used, from this formula. This formula only shows the patients' average length of stay in a hospital. Hence, without any concrete information we can derive from the average length of stay, this factor is unrelated to the decision to become involved in medical tourism. Based on the thesis (Wu, 2000), the average length of stay bears no relationship to hospital effectiveness.

vi.) Number of doctors

The demand for medical services will be affected by the number of medical service suppliers: doctors. Some people think that increasing the number of doctors will lead to increasing demand. However, the increase in demand is limited. If there are sufficient medical resources, increasing the number of doctors will not lead to additional demand for medical services. Taiwan, without doubt, is a country with sufficient medical resources. Therefore we conclude, based on our research results,

that the number of doctors has no correlation with the participation in medical tourism for hospitals in Taiwan.

Finally, in the classification matrix (see Table 3), we can check the discriminant abilities of the six chosen variables. The figure 67 means there are 67 hospitals which are classified in group 1 by our analysis and in fact, are also in group 1 and the figure 23 is explained in the same way. Therefore we calculate the hit ratio, which equals to 81.8%.

Table 3: Classification Matrix of Analysis I

		2 (P), 1 (NP)	Predicted Group Membership		Total
			1(NP)	2(P)	
Original	Count	1(NP)	67	13	80
		2(P)	7	23	30
	%	1(NP)	83.8	16.3	100.0
		2(P)	23.3	76.7	100.0

II.) Analysis II

In the second analysis, we want to use the variables that we choose to discriminate the level of the hospitals, premium or excellent and examine whether it corresponds to the results by the government's rating system. First, we pick out the six significant variables, just the same as the first analysis (see Table 4).

Table 4: Tests of Equality of Group Means of Analysis II

Variables	F	Sig,
<i>Daily number of outpatient visits</i>	40.741	.000
<i>Daily number of inpatients</i>	38.365	.000
<i>Average length of stay</i>	.484	.488
<i>Bed occupancy rate</i>	9.574	.003
<i>Number of departments in a hospital</i>	23.258	.000
<i>Number of Hospital beds</i>	38.035	.000
<i>Number of doctors</i>	1.750	.189
<i>Amount of comprehensive medical personnel</i>	48.237	.000

Then, we see that daily number of outpatient visits, number of departments in a hospital, number of hospital beds, and amount of comprehensive medical personnel have positive effects on our outcome and the other two, daily number of inpatients and bed occupancy rate, do negatively (see Table 5).

Table 5: Standardized Canonical Discriminant Function Coefficients of Analysis II

Variables	Function
Daily number of outpatient visits	.670
Daily number of inpatients	-.471
Bed occupancy rate	-.010
Number of departments in a hospital	.127
Number of hospital beds	.190
Amount of comprehensive medical personnel	1.030

And in this classification matrix (see Table 6), we can find the hit ratio of analysis III is 83.6%.

Table 6: Classification Matrix of Analysis II

		2 (premium), 1 (excellent)	Predicted Group Membership		Total
			1 (excellent)	2 (premium)	
Original	Count	1 (excellent)	74	8	82
		2 (premium)	10	18	28
	%	1 (excellent)	90.2	9.8	100.0
		2 (premium)	35.7	64.3	100.0

III.) Analysis III

In the third analysis, we combine the first and the second analysis together. First, as usual, we pick out the six significant variables (see Table 7).

Table 7: Tests of Equality of Group Means of Analysis III

Variables	F	Sig.
<i>Daily number of outpatient visits</i>	16.702	.000
<i>Daily number of inpatients</i>	14.207	.000
<i>Average length of stay</i>	1.094	.355
<i>Bed occupancy rate</i>	3.476	.019
<i>Number of departments in a hospital</i>	11.941	.000
<i>Number of hospital beds</i>	13.494	.000
<i>Number of doctors</i>	.603	.614
<i>Amount of comprehensive medical personnel</i>	20.073	.000

Second, in the eigenvalues analysis (see Table 8), we get three functions. The first one has 71.7% of the effectiveness to classify the hospitals and the second one has 21.7% of it. Thus, we take these two, which have 93.4% of the effectiveness, for our following steps.

Table 8: Eigenvalues of Analysis III

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
<i>1</i>	.849 ^a	<i>71.7</i>	71.7	.678
<i>2</i>	.257 ^a	<i>21.7</i>	<i>93.4</i>	.452
<i>3</i>	.078 ^a	6.6	100.0	.269

Then, in the structure matrix, for the first function, we choose the four variables (daily number of outpatient visits, daily number of inpatients, bed occupancy rate and number of departments in a hospital) whose correlated coefficients are more than .625, which means they are highly related to our outcome (see Table 9).

Table 9: Structure Matrix of Analysis III- Function 1

Variables	Function 1
<i>Daily number of outpatient visits</i>	<i>.806*</i>
<i>Daily number of inpatients</i>	<i>.730*</i>
<i>Bed occupancy rate</i>	<i>.626*</i>
<i>Number of departments in a hospital</i>	<i>.625*</i>
Number of Hospital beds	.133*
Amount of comprehensive medical personnel	-.155

In the same way, we choose the two variables (daily number of inpatients and bed occupancy rate) whose correlated coefficients are more than .251 for the second function (see Table 10).

Table 10: Structure Matrix of Analysis III- Function 2

Variables	Function 2
Daily number of outpatient visits	.150
Daily number of inpatients	.251
Bed occupancy rate	.336
Number of departments in a hospital	-.137
Number of hospital beds	.062
Amount of comprehensive medical personnel	.142

Furthermore, by using the group centroids analysis, we take function 1 to put group 1 and 3 into one category where they are both equal or less than .369 and put group 2 and 4 into the other one where they are more than .369 (see Table 11).

Table 11: Functions at Group Centroids of Analysis III- Function 1

Groups	Function 1
1 (Not participate in medical tourism & Excellent)	-.615
2 (Not participate in medical tourism & Premium)	.477
3 (Participate in medical tourism & Excellent)	.369
4 (Participate in medical tourism & Premium)	1.931

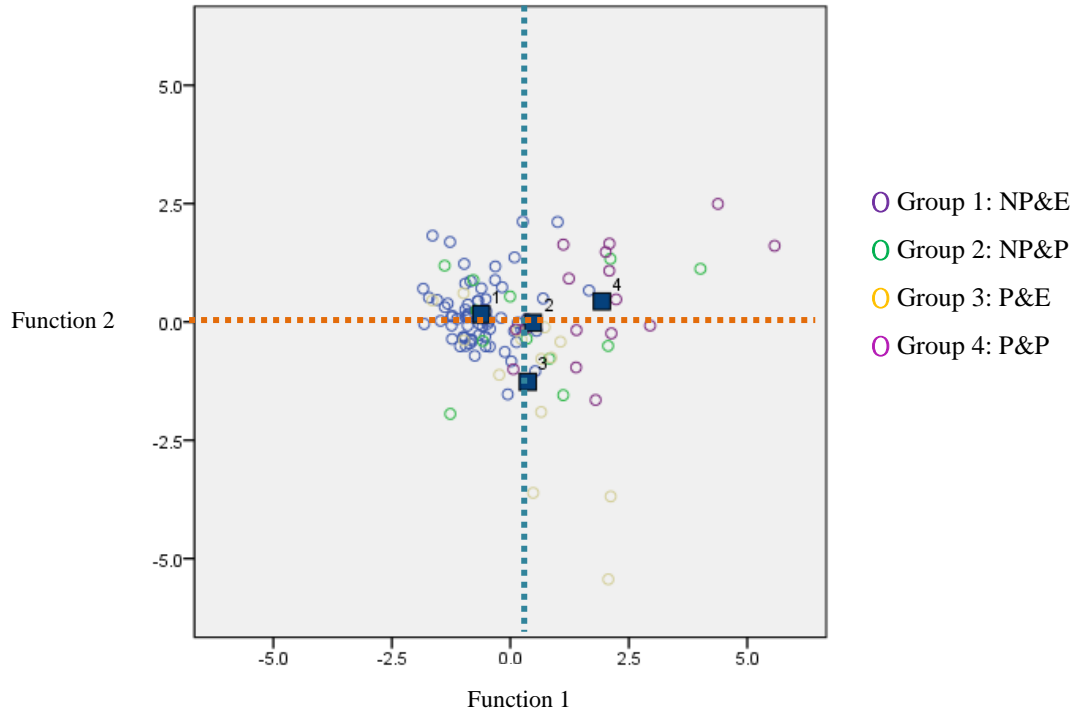
In the same way, we use the second function to put group 1 and 4 into the same classification where they are both positive and put group 2 and 3 into the other one where they are negative (see Table 12).

Table 12: Functions at Group Centroids of Analysis III- Function 2

Groups	Function 2
1 (Not participate in medical tourism & Excellent)	.162
2 (Not participate in medical tourism & Premium)	-.019
3 (Participate in medical tourism & Excellent)	-1.266
4 (Participate in medical tourism & Premium)	.434

We can see more clearly how the two functions discriminate the groups. Figure 4 conclude the previous two paragraphs.

Figure 4: Canonical Discriminant Function of Analysis III



In the group statistics of function 1, we observe some trends (see Figures 5-A, 5-B). The figures of the hospitals in premium level are all more than those in excellent one.

Figure 5-A: Group Statistics of Analysis III- Function I

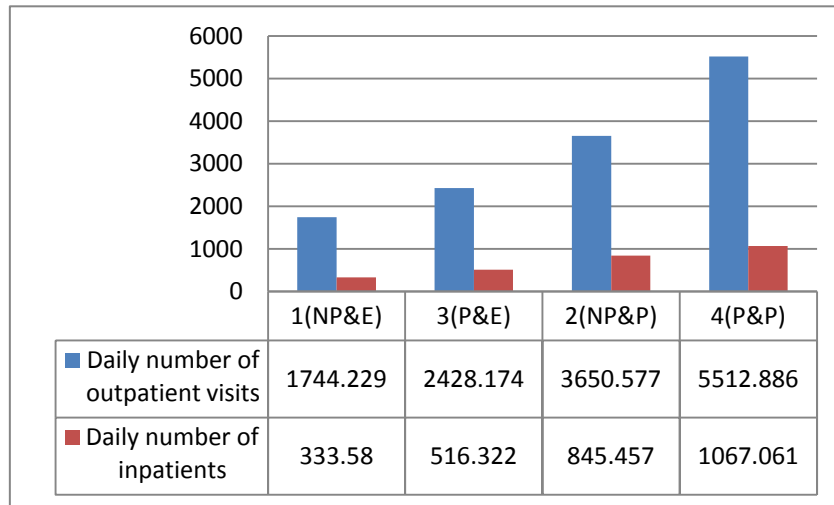
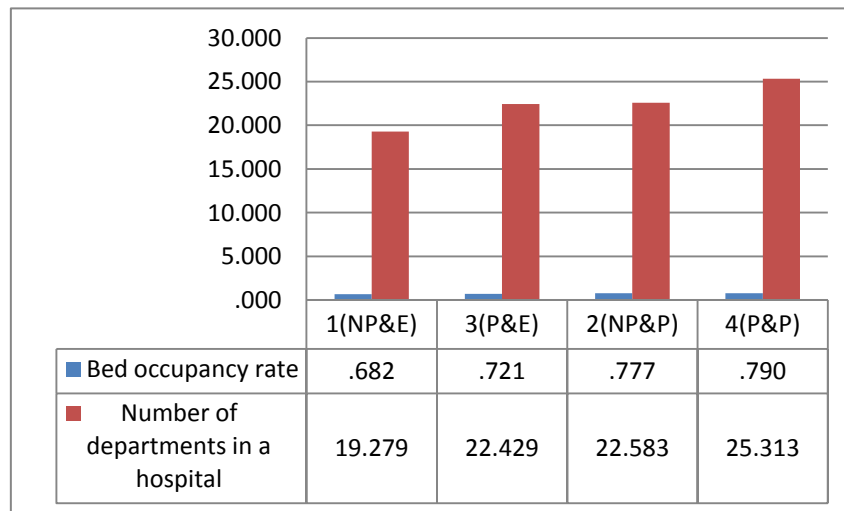


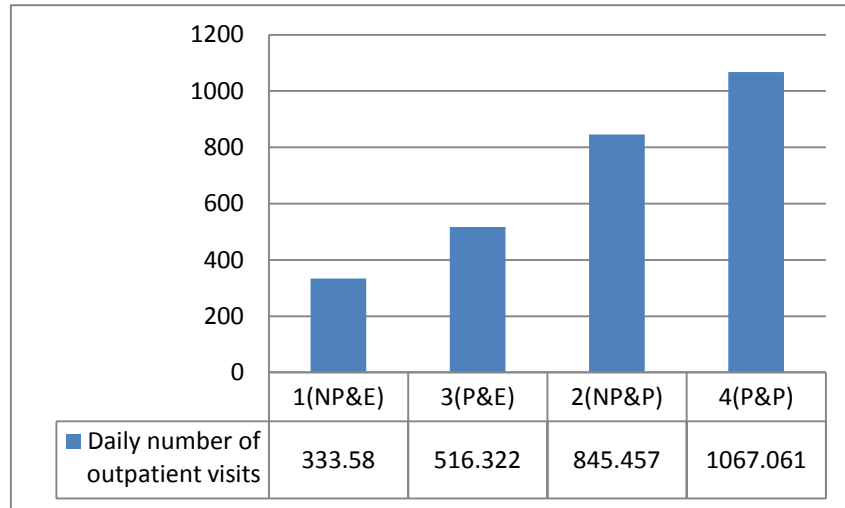
Figure 5-B: Group Statistics of Analysis III- Function I



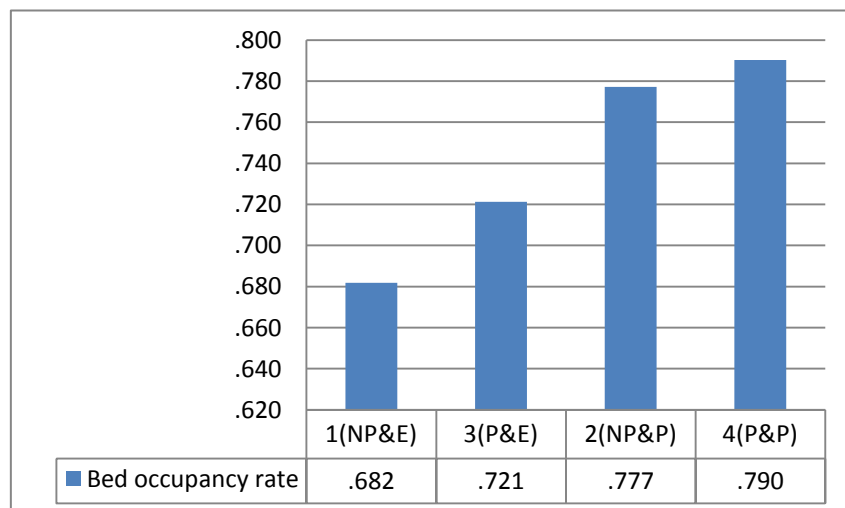
From the group statistics of function 2, we also see some trends (see Figures 6-A, 6-B). The figures of the fourth group are the highest. That is, if the hospitals' positions are in group 2, which is premium but do not participate in medical tourism now, if those hospitals want to do it in the future, they should increase both their daily number of inpatients and bed occupancy rate. Similarly, if the hospitals are in group 3,

which joins the medical tourism, but is in merely excellent level and would like to be premium, what they should do is to increase the two variables we mentioned above as well.

Figures 6-A: Group Statistics of Analysis III- Function II



Figures 6--B: Group Statistics of Analysis III- Function II



Finally, we get the hit ratio of analysis III, 70.9% (see Table 13).

Table 13: Classification Matrix of Analysis III

		4(P&P) 、 3(P&E) 、 2(NP&P) 、 1(NP&E)	Predicted Group Membership				Total
			1	2	3	4	
Original	Count	1	57	2	6	3	68
		2	5	3	2	2	12
		3	3	3	8	0	14
		4	2	2	2	10	16
	%	1	83.8	2.9	8.8	4.4	100.0
		2	41.7	25.0	16.7	16.7	100.0
		3	21.4	21.4	57.1	.0	100.0
		4	12.5	12.5	12.5	62.5	100.0

V. Conclusion

Medical tourism has become one of the industries that government of Taiwan pays efforts to promote in recent years. It's because most hospitals in Taiwan not only have the required technology but also have advantages in medical tourism. Hence, we hope this research will become a useful guideline, or systematic evaluation for hospital administrations and policy makers, to assist them in deciding what kind of strategy or policy they should enact.

In our analysis, we find out the six variables--the daily number of outpatient visits, the daily number of inpatients, bed occupancy rate, the number of departments in a hospital, the number of hospital beds and the amount of comprehensive medical personnel--as the characteristics of a hospital might impact its decision of whether to participate in medical tourism or not. Besides, given our presumption and analysis above, we suggest that a hospital's decision should be based on the consideration of both financial and technical resources.

Furthermore, our findings can also be used to evaluate a hospital's performance. We suggest that if a hospital would like to upgrade its accreditation level from excellent to premium, it should do its utmost to increase its daily number of outpatient visits, daily number of inpatients, bed occupancy rate and number of departments, which stand for the quantity of medical service. The more medical service a hospital

offers, the greater contribution it makes to the public's health. Therefore, a hospital's accreditation level may improve.

Suppose that all hospitals want to participate in medical tourism as well as to perform premium, we suggest that they should increase both their daily number of inpatients and bed occupancy rate if they want to achieve this goal.

Additionally, we would like to give some suggestions to our government for assisting the development of this thriving industry in Taiwan. Firstly, because the six variables we focus on above also classify the hospitals' accreditation level well, the authorities in Taiwan, the Department of Health, may incorporate those variables when it evaluates hospitals' performance.

Secondly, since those variables have good ability to decide whether a hospital is qualified to be involved in medical tourism, we suggest the authorities should provide clearer information about the variables so that foreign patients who want to receive medical services in Taiwan can choose appropriate hospitals and other hospitals can improve their performance if they have intention to participate in medical tourism.

This research is merely a start of study on the aspect of hospitals. We believe more detailed and accurate evaluation of a hospital's performance on medical tourism should be carried out. However, a hospital should always thoroughly understand itself before being eager to reach success.

VI. References

1. **Leahy, A.L.** 2008. "Medical tourism: The impact of travel to foreign countries for healthcare." *The Surgeon*, 6(5): 260-261.
2. **Newman, B.Y. O.D.** 2006. "Medical tourism: Optometry." *Journal of the American Optometric Association*, 77(12): 581.
3. **Huang, C.M.** 2007. "Taiwan Has Great Potential of Developing Medical Tourism." *Taiwan Economic Forum*, 5(10): 39-43.
4. **Yang, W.H.** 1993. "The Study of Outpatient Operating Cost Analysis Model and Its Influential Factors." Master's Thesis. China Medical University.
5. **Liu, Y.F.** 1993. "A Relative Efficiency View of Physician-Nurse Ratios." Master's Thesis. China Medical University.
6. **Huang, S.C.** 1998. "The Research of Hospital Productivity." Master's Thesis. National Taiwan University.
7. **Wu, C.S.** 2000. "Measuring the Efficiency of Hospitals-The Hospitals of the Department of Health as an Example." Master's Thesis. National Chiao Tung University.
8. **Hsu, C.C.** 2001. "Study on Factor to Affect Average Price of Outpatient, Average Price of Inpatient, Occupancy Rate of Hospital." Master's Thesis. Fu Jen Catholic University.

9. **Chu, L.P.** 2001. "The Management Diversification Scenario - A Survey of Taiwan Hospital." Master's Thesis. National Taipei College of Nursing.
10. **King, C.Y.** 2002. "The Effect of Market Competition on Hospital Output Performance." Master's Thesis. National Yang Ming University.
11. **Tsai, C.T.** 2004. "Patient Characteristics and Medical Resources Utilization of Intensive Care Patients Who Discharged from Hospitals and then Readmitted to Intensive Care Units." Master's Thesis. National Taiwan University.
12. **Chen, M.R.** 2005. "Establishing a forecasting model for outpatient volume--Based on a community hospital." Master's Thesis. China Medical University.
13. **Huan, Y.F.** 2005. "Hospital Performance Evaluation and Management in Taiwan." PhD. diss. National Chiao Tung University.
14. **Wang, C.Y.** 2005. "The factors that influenced the patient's length of stay in hospital --Application for physician profile." Master's Thesis. National Yang Ming University.
15. **Lo, C.** 2007. "The Feasibility of Development International Medicine for a Regional Teaching Hospital in Taiwan : A Case Study of Parkway Holdings Limited in Singapore." Master's Thesis. Yuan Ze University.
16. **Chiu, H.Y.** 2007. "Supplier-induced Demand : Physician Density and

- Productivity.” Master’s Thesis. Chang Jung Christian University.
17. **Wu, J.S.** 2008. “The Exploration Study of the Business Model for Medical Tourism in Taiwan.” Master’s Thesis. National Taiwan University.
18. **Yang, M.H.** 2008. “A study on the marketing strategy research of medical tourism industry development in Taiwan.” Master’s Thesis. National Taiwan University.
19. **Choi, S.F.** 2009. “Taiwan Medical Tourism Cluster.” Master’s Thesis. National Chengchi University.
20. **Taiwan Task Force for Medical Travel.** 2010. Taiwan Nongovernmental Hospitals & Clinics Association. <http://www.medicaltravel.org.tw/>
21. **Department of health, Executive Yuan, R.O.C. (Taiwan).** 2010. Department of health, Executive Yuan, R.O.C. (Taiwan). http://www.doh.gov.tw/cht2006/index_populace.aspx
22. **Medical Resource Management-Geographic informational system.** 2010. Department of health, Executive Yuan, R.O.C. (Taiwan). <http://gis.doh.gov.tw/>