A HEDONIC PRICING ANALYSIS: EVALUATING PRICES OF HOSPITAL'S PATIENT ROOM IN BANGKOK

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Abstract

The purposes of this research were to examine the factors affecting the room price of private hospitals and public hospitals in Bangkok. The conceptual framework was based on hedonic pricing model. The sample included 5 public hospitals and 28 private hospitals in Bangkok. The results showed that the accreditation, location, land price, and the type of room, and private hospital listed in the Stock Exchange of Thailand (SET), had a positive impact on hospital room price. The accreditation had a comparable positive effect on room price as the hospital listed in the SET, this result implied that the hospital could improve the image of the hospital by listing in SET or apply for international accreditation to increase the room price.

Keywords: Hedonic Pricing, Patient Room Price, Hospital

Introduction

Medical services and public healthcare accessibility are essential to people's lives (Limwattananon, Tangcharoensathien, Tisayaticom, Boonyapaisarncharoen, & Prakongsai, 2012). The government has an important role to play in establishing healthcare systems and facilitating access to such systems through public welfare. Thailand's 2002 National Health Security Act focuses on supporting human rights in public health. Based on their status, Thai citizens are entitled to receive medical services from one of the three primary systems (namely, civil servants and state enterprises welfare, social security system, or universal healthcare coverage). The National Health Security Act promotes health equity; thus, people with differences in social status, nationalities, financial status, accommodation, and location can receive and have access to medical service equally (World Health Organization, 2020).

Since 2012, Thailand has implemented the Universal Coverage Scheme (UCS), which benefits over 48.797 million Thai citizens and totaling 175,560 million baht (6.05% of the

national budget). This scheme has improved the quality of life by raising the equity of accessibility and reduced the cost of household expenditure required for healthcare. Nevertheless, the restructured hospitals in Thailand are facing the issue of insufficient providers and beds due to their increasing number of patients. One of the reasons is the structural changes in Thai demographics; such changes include an aging society, continuing urbanization, and numerous growths in middle-class consumers with high spending power. Moreover, people are focusing more on health awareness, which is a current global trend where people take care of their healthcare and wellness (Ninkitsaranont, 2019). In the survey by the National Statistics Office in 2017, other explanations on why people opt for these facilities included long waiting time, limited operating hours, and UCS not covering the inconvenience of traveling or the services that they need. Thus, some people choose alternative healthcare facilities that are not covered by the UCS, such as general practice clinics or private medical institutions. Hence, in this work, we want to study the price differentiation among public and private hospitals and determine how much subsidy the government can give to this group of patients.

The current trend shows that the private hospital business is growing, with an average annual growth of 10%–13%. Thus, private hospitals expand rapidly, and the competition is becoming more intense, especially in Bangkok where most of the healthcare facilities in Thailand are located. Private hospitals are known to provide excellent customer service and modern facilities. They also create new initiatives to impress their customers, such as offering a limousine service or setting up subsidiaries to expand their business and fulfill their customers' needs, such as having restaurants, florists, or convenient stores on their premises.

Patient rooms, with many different types and functions, are essential for making patients and relatives feel comfortable. Moreover, the high price of patient rooms in private hospitals comes along with hospital quality, location, and a convenient environment.

Generally, private hospitals are equipped with modern or luxurious interiors compared with the free ones. They also offer a wide range of room types, from standard rooms to suites. Most of the public hospitals in Thailand give an old-fashioned look with outdated equipment. Nevertheless, some premier institutions have been developed to compete with private hospitals by using their advantage of having exceptional doctors and other healthcare professionals. For example, the Siriraj Piyamaharajkarun Hospital is built to cater to high-

income patients with modern facilities. Nonetheless, the room rates are still considerably cheaper although they have similar services and facilities. Accordingly, this study aims to investigate the factors that contribute to the room rate of private hospitals in Bangkok compared with those of public hospitals that have a similar attribute.

The financial crisis in 1997 affected the number of patients seeking private hospital care and private hospitals' growth. High-end clients, who are the most important group of clients in the private sector, changed their choice of healthcare facilities, such as turning to public facilities instead. Hence, private hospitals changed their strategy by focusing on foreign patients, especially those who are from high purchasing power countries, such as Japan, the Middle East, and Europe. Moreover, since 2003, the Thai government has made progressive policies to make Thailand a medical hub; such policies include promoting medical tourism, given that the country has its strength in wellness and medical services (Kulkalyuenyong, 2017).

After the financial crisis, Thailand has attempted to attract more foreign patients to receive medical services in Thailand, which causes medical expenses to increase. However, one of the problems is that international patients do not know the quality of Thai medical service, which causes a lack of trust. Hospitals have attempted to solve this problem by acquiring the JCI standard, which is globally accepted. As a result of this guarantee in standard, Thai hospitals have become increasingly well-recognized and trusted worldwide. The purpose of obtaining the JCI standard is to improve hospital values and services. Thus, this study aims to investigate whether the JCI standard for international patients will affect the cost of the patient room price for local and foreign patients in Thailand. Hence, this study could help hospitals with JCI accreditation be able to charge higher rates to international patients

For hospital location, the leading private hospitals in Bangkok are usually located in the central business district (CBD) area, such as Bumrungrad Hospital and Samitivej in Sukhumvit, Bangkok Hospital in Petchaburi, which are conveniently accessible by various public transportations. They are also surrounded by luxury residences, office tower supplies, local infrastructures, mass transit lines, general transport links, and prime shopping malls, making their location of high land value. CBD areas compose of Silom, Sathorn, Rama IV Road, Wireless Road, Lumpini, Sukhumvit, and Asoke (Tantisunthorn, 2011). The popularity of Bangkok's mass transit routes with over 1.2 million users a day has increased land values.

Land values have been partially determined by the demand of a line and a station. Land prices are starting to form a considerably more significant proportion of the total development cost because they have risen at faster rates than construction costs. Thus, total development cost has risen, mainly due to the increase in land prices. In this study, we want to investigate whether hospital location affects the cost of patient rooms.

Based on the above discussion, the objectives of this study are as follows.

- To investigate the factors that contribute to the room rate of private hospitals in Bangkok in comparison with public hospitals that have a similar attribute.

- To study the price differentiation between public and private hospitals and determine how much subsidy the government can give to this group of patients.

- To study whether JCI standard for international patients affects the value of patient room price for local and foreign patients in Thailand.

- To study whether hospital location affects the cost of patient rooms.

However, room quality varies; hence, comparing the rate directly is inappropriate. In this study, we apply the hedonic pricing technique to measure the implicit prices of each of the rooms' facilities based on the attributes, location, and type of the hospital. These factors can be influential to the rate of patient rooms in Bangkok hospitals, given that quality has been controlled.

Review of Literature

Rosen first introduced the hedonic price model in 1974. This model is used for measuring the implicit price of differentiated products based on the specific value of their characteristics. This model can be applied to any market for differentiated products, such as housing, condominiums, apartment rental, and hotels.

Many studies have applied hedonic models. However, for patient room rate comparison, no study has identified the characteristics of patient rooms that affect the rate. In this study, we apply the case of hotel room rates. For example, hedonic methods are used to analyze the effects of many characteristics on hotel room prices in Taipei. Results showed that chained brand, room size, location, availability of LED TV, bar, internet access, shuttle bus service, conference facilities, and fitness center significantly affect hotel room rates (Chen & Rothschild, 2010).

Falk (2008) identified the relationship between lift ticket prices and characteristics that affect the prices of ski resorts in Austria. Hedonic methods have also been used to explain variations in house prices and develop House Price Index by statistically controlling for the differences in the physical attributes of properties that affect the residential housing values in Thailand (Calhoun, 2003).

Hill (2013) showed that housing is an extreme case of differentiated products because every house is different. Hedonic methods explain house prices as a function of a vector of characteristics and can be applied to construct quality-adjusted price indexes for differentiated products.

For each hospital, information about characteristics, such as facilities, CBD, hospital quality, room types, and prices of various room amenities, can be collected by using data from the patient room prices in a private hospital accredited by the JCI in Bangkok (JCI, 2019), private hospitals located nearby medical schools accredited by Hospital Accreditation (HA), and patient room type in medical schools that pass the accreditation of the World Federation for Medical Education (WFME) Global Standard, Basic Medical Education. Several attributes are more important than others and may be useful for customers (patients and relatives), the government, service providers, and foreign patients. They can use the findings of the hedonic price model to identify the facilities and services that private and premium medical hospitals should offer to achieve higher prices.

In this study, we prefer to approach the problem from the “supply” side.

Hedonic Pricing Theory (Rosen, 1974)

Hedonic pricing theory is formulated as a problem in the economics of spatial equilibrium, in which the entire set of implicit price guides consumers and producers’ location decisions in characteristics space (Rosen, 1974).

We apply a hedonic pricing model with patient room price and depend on the appropriate assumption where characteristics of patient room type are identical with no differentiation among features. However, some economists who have studied related topics argues that each hospital generally has different types of room and characteristic. Such a difference can be classified into major groups, such as location, hospital type, hospitals listed on Thailand stock exchange, distance from BTS and MRT, distance from Chaophya River, and

characteristic of patient room type. Furthermore, the implicit price of each characteristic of the patient room price is uncorrelated.

Bid Rent Theory (Alonso, 1964)

Bid rent theory is a geographical, economic theory that refers to how the price and demand for real estate change the distance from the CBD increases. The theory states that different land users will compete with one another for lands close to the city center. This implication is based upon the idea that retail establishments wish to maximize their profitability, such that they are considerably more willing to pay more for lands close to the CBD and less for properties further away from this area.

Location theory is concerned with the distance, economies of agglomeration, and rent-seeking in the location of firms and industries. The location pattern of land use in an urban area focuses on the center with high land values because of high accessibility. These characteristics of urban location are as follows (Alonso, 1964). The city in the original area is assumed to be monocentric, which implies that all production activities in the surrounding area are supposed to commute to the CBD.

Given that the CBD has many potential patients, several hospitals are located in city areas. Patients can get help from the nearest hospital location. In this study, we want to examine whether hospital location affects the price of patient rooms.

Land Readjustment

Land readjustment is the method for developing or improving urban infrastructure and enhancing the value of the land. Inland readjustment, the original landowners or occupants voluntarily offer the portions of their land to the government or other project initiators. The government then plans out the whole area with roads, infrastructure, open space, and public facilities, and in some cases reserves land for sale and other social purposes. In return, each landowner receives a serviced plot of smaller areas, but often at a considerably higher value within the same neighborhood. This condition is a win-win situation because the government can upgrade the community without having to use its power of eminent domain (expropriation), whereas the landowners can remain and enjoy improved living conditions and an increase in the value of their real asset.

In the case of Siriraj Hospital, which was founded by King Chulalongkorn in 1888, it increases the value of the land price and community around it. When land is donated

to the government for building hospitals, it contributes to the community around it because hospitals are a basic need of humans.

Asymmetric Information

The theory of asymmetric information was developed in the 1970s to explain situations where there is an imbalance of information between buyers and sellers, which can lead to inefficient outcomes in the market (Akerlof, 1970). Asymmetric information occurs when the seller has more knowledge of goods and services than the buyer. Many cases of asymmetric information are evident in healthcare services. For example, doctors typically know more about medical practices than their patients because they have extensive medical school educational backgrounds that their patients generally do not have (Shmanske, 1996). In some cases, patients do not know about the hospital quality. For Thai patients, they are willing to opt for a large hospital even for minor treatments, and some choose high-quality hospital over the nearest ones. However, interacting and sharing information with the neighbor does not necessarily help in selecting a high-quality hospital. For example, patients may give importance to specific attributes, such as appearance, comfort, and convenience of hospitals (Goldman & Romley, 2010). Hospital owners know about the quality of the hospital they go to, which is not the case for international patients. This situation causes asymmetric information between healthcare providers and international patients, which results in the incapability to charge a higher service fee.

Consequently, to adjust for asymmetric information problems on the hospital quality and create opportunities for access to information to international patients, hospitals attempt to acquire the standard that is well accepted internationally to gain patients' trust in hospital quality. Hospitals need to have gold standard treatments to guarantee their service quality. The JCI standard provides an opportunity for the hospital to increase medical costs. This study aims to investigate whether the JCI standard for international patients affects the value of patient room price for Thai and international patients.

RESEARCH METHODOLOGY

We obtained patient room price and its characteristics from websites for the data of our study. However, some data are not available. Therefore, we acquired primary data via survey from the admission center in the hospitals instead. We applied the hedonic pricing

model to evaluate the implicit price of patient room types. We focused on private hospitals and medical schools in Bangkok and obtained data from the internet.

Emprical Model

We used a general model, in which the products are described by n attributes or characteristics.

The implicit price of characteristics can be estimated by regression analysis. Generally, this relationship may be described with the use of the following function:

$$P_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki} + \varepsilon_i$$

where P_i is the patient room price

α is the constant

X_{ki} is the patient room attributes or characteristics/location/type

β_k is their associated coefficients.

This model is regarded as the linear regression model, where P_i represents the patient room price, α is the constant, X_{ki} is the patient room attributes or characteristics, and β_k is their associated coefficients. Thus, the general hedonic function can be presented as follows.

Patient room price = f (INNER, LnLANDP, SET, PRIVATE_nonSET, JCI, Luxury living room, Luxury bedroom)

Hedonic price equation:

$$P_i = CONSTANT + \beta_1 INNER_{1i} + \beta_2 LnLANDP_{2i} + \beta_3 SET_{3i} + \beta_4 PRIVATE\_nonSET_{4i} + \beta_5 JCI_{5i} + \beta_6 LUX\_L_{6i} + \beta_7 LUX\_B_{7i} + \varepsilon_i$$

The set of qualitative attributes is measured on a binary scale, involving dummy variables, where 1 indicates presence and 0 indicates absence.

However, hedonic pricing models may suffer from the severe problem of autocorrelation and multicollinearity among variables. The principal component analysis is a feature extraction method used to solve the seriousness of the multicollinearity problem by reducing some variables of a dataset that highly correlate with one another and creating new uncorrelated variables.

Data

In this study, we controlled the quality of private hospitals and medical schools to maintain the standard of the hospitals in the dataset by using the JCI for private hospitals and the WFME for government hospitals. In this study, we focused on 28 private hospitals and 5 medical schools in Bangkok to avoid the heterogeneity problem induced by the environmental effect.

In addition to medical schools and private hospitals in Bangkok, we also included private hospitals that are in the vicinity of medical school hospitals. These private hospitals employ physicians from medical schools to part-time clinics, such as Thonburi Hospital, Thonburi2 Hospital, Phayathai1 Hospital. For each hospital, information about characteristics, such as facilities, room types, room size, and prices of various room amenities can be found online or data from the hospital information center.

For our analysis, the dependent variable is patient room price per night for each hospital (*ROOMPRICE*), which includes nursing, hospital, and food fee. The independent variables represent seven attributes that affect patient room prices. The quantitative attribute that is thought to determine room price is a land price, which is measured in baht per square wah. The qualitative characteristics include the hospital location, hospital type, hospital quality, hospital listed on SET, the luxury of the living room, and bedroom in the patient rooms of each hospital. These qualitative attributes are measured on a binary scale that involves dummy variables, where 1 indicates presence, and 0 indicates absence. However, some characteristics (e.g., bathroom with a shower, electronic bed, sofa, telephone, television, dining table, dishware, safety box, and Internet access) are present in all private rooms of hospitals in the sample. Therefore, we excluded these attributes from the set of independent variables.

Table 1 summarizes the dependent and independent variables in this study.

Table 1 List of variables and expected sign

Variable	Description of variable/attribute	Expected sign
ROOMPRICE	Room price per night	
INNER	Hospital located in the inner core of Bangkok (yes=1)	+
LnLANDP	Land price (million baht per square wah)	+
SET	Hospital listed on SET (yes=1)	+
PRIVATE_nonSET	Hospital type (Private=1, Medical school=0)	+
JCI	JCI-accredited hospital (yes=1)	+
LUX_L	Patient room with the luxury of living room	+
LUX_B	Patient room with the luxury of bedroom	+

The independent variables used in this study are divided into three groups follows.

Location

INNER represents the inner core of Bangkok, which is a variable that indicates the hospital location, followed by the department of city planning and urban development. The inner core of Bangkok contains 21 districts, whereas the outer core of Bangkok contains 6 districts. When INNER is a dummy variable that takes the value of 1, the hospital is located in the inner core of Bangkok, and 0 otherwise. Hospitals located in the inner core of Bangkok tend to be more costly than hospitals in other areas because the inner core of Bangkok is the center of commercial regions. Many private companies, government agencies, and state enterprises are located in the inner core of Bangkok (Thantisunthorn, 2011). Thus, patient room price in these areas has a positive correlation.

LnLANDP represents the logarithm form of land prices of the area where a hospital is located and is measured in million baht per square wah. Land price appraisal of districts in Bangkok during the period of 2016–2019 can be obtained from the Treasury Department.

Hospital type

SET represents the hospitals listed on the SET, where 1 indicates that the hospital is listed on the SET index, and 0 otherwise.

PRIVATE_nonSET represents the private hospitals not listed on the SET, where 1 indicates that the patient cannot claim the right to reimburse medical expenses from the government, and 0 otherwise.

JCI represents private hospitals that are accredited by the JCI, where 1 indicates that the hospitals are JCI-certified, and 0 otherwise.

Characteristics of Patient Rooms

We determine the characteristics of the patient room in terms of the luxury of the living room and bedroom. Some attributes (e.g., bathroom with a shower, electronic bed, sofa, telephone, television, dining table, dishware, drawer, safety box, and Internet access) are simple facilities that are present in all types of hospital private rooms. Therefore, the difference between room types depends on the luxury of a living room and bedroom, which is designed by each hospital. Moreover, highly linear correlations exist among the attributes in the sample, which may cause a multicollinearity problem. Therefore, we used principal component analysis to reduce the variables into one factor (Ismael & German, 2018) and create a composite index that represents the degree of the luxury of a living room and bedroom.

Luxury living room represents the luxury of a living room, which contains a sofa, a television, and a dining table. The degree of the luxury of the living room is created from four characteristics, which are living room with bathroom, living room with dining table, living room with sofa, and living room with TV.

Luxury bedroom represents the luxury of a bedroom for patient relatives, including a TV, a bed, and a bathroom. The degree of the luxury of the bedroom is created from the three objects.

Results and Discussion

This study investigates the effects of various attributes on the patient room rate in private hospitals and medical schools in Bangkok. Table 2 reports the descriptive statistics for the independent variables considered in this study.

Table 2 Descriptive statistics for attribute variables

Variables	Obs.	%	**Room fee** (baht/unit)	**Land price**(baht/wah^2)
Location				
Outer	50	28.4%	8,686.20	48,780.00
Inner	126	71.6%	10,865.04	246,504.00
t-test			2.01**	9.15***
Land Price				
Low	136	77.3%	9,625.59	119,474.30
High	40	22.7%	12,355.63	431,250.00
t-test			2.35**	20.04***
Type				
medical school	23	13.1%	6,244.35	281,087.00
private_nonSET	65	36.9%	9,416.92	126,553.80
private_SET	88	50.0%	11,904.38	213,721.60
F-test			8.28***	11.41***
Certified				
NonJCI	56	31.8%	7,752.14	221,160.70
JCI	120	68.2%	11,409.88	175,945.80
t-test			3.57***	1.79*
Luxury of living room (0-1)				
no luxury	98	55.7%	6,655.46	193,030.60
Luxury	78	44.3%	14,757.31	186,942.30
t-test			10.3290***	0.2551
Luxury_of bedroom (0-1)				

no luxury	160	90.9%	9,350.31	198,809.40
Luxury	16	9.1%	19,203.44	105,562.50
t-test			6.35***	2.29**

Note: * Statistical significance at the 90% level; ** Statistical significance at the 95% level; *** Statistical significance at the 99% level.

According to the descriptive statistics of all patient room types in Bangkok, data for 176 observations were obtained from 5 medical schools and 28 private hospitals. The results are as follows.

Most of the room types are located in the inner core of Bangkok (71.6%), with an average patient room price of 10,865.04 baht/unit, whereas those located in the outer core (28.4%) has an average patient room price of 8,686 baht/unit. The land price between the inner and outer locations is different on average.

Approximately 77.3% of patient room types with a low land price has a room fee of 9,625.59 baht/unit, whereas 22.7% with a high land price has a room fee of 12,355.63 baht/unit. The average low land price is 119,474 baht per square wah, and the high land price is 431,250 baht per square wah. This result indicates a considerable difference gap in average room fee at the low land price of 9,625 baht per unit and the high land price of 12,355 baht per unit. Therefore, land price affects the patient room rate.

For the hospital type, most patient rooms in this study are from private hospitals listed in Thailand's stock exchange, with an average cost of 11,904.38 baht/unit. The percentage of patient room types at a medical school is 13.1%, whereas 36.9% represents a private hospital. Most of the hospitals acquired the JCI standard to charge a higher room rate. The land price of medical schools is relatively high because they are located in the center; whereas private hospitals' land price is not as high because they are not in SET.

Most of the hospitals (68.2%) were accredited by JCI, with an average room price of 11,409.88 baht/unit. Results show that JCI-accredited hospitals charge higher room price. However, from the above information, land price is not a factor for hospitals to acquire the JCI standard.

In terms of the luxury of the living room, 55.7% of the patient room have no luxury of the living room, whereas 44.3% have it. The average cost is 14,757.31 baht/unit. If the hospital adds a living room, then it can charge for a double room rate. The luxury of the living room is not the main contributing factor because the hospitals with high land prices might not offer this option.

Most of the patient rooms have no luxury of a bedroom, the average cost is 19,203.44 baht/unit. The price can be doubled from a room without a bedroom. Moreover, the hospitals located in low land price areas can increase the value by having a luxurious bedroom.

The results from the four hedonic pricing models reported in Table 2 show that most of the independent variables are significantly correlated with the patient room price, except for private hospitals that are not listed on SET (PRIVATE_nonSET). For all models, the explanatory power of the model is robust, explaining between 57% and 61% of the variations in prices, as measured by the adjusted R^2. Therefore, hospitals listed on SET (SET), JCI-accredited hospitals (JCI), hospitals located in the inner area of Bangkok (INNER), land price (LnLANDP), the luxury of the living room (Luxury living room), and the luxury of bedroom (Luxury bedroom) have a positive influence on patient room price.

We estimated Models 1 and 2 by using pooled OLS and random effect regression, respectively. We have six variables, namely, hospitals listed on SET (SET), logarithm form of land prices (LnLANDP), JCI-accredited hospitals (JCI), the luxury of the living room (Luxury living room), and luxury of bedroom (Luxury bedroom), which have significant effects on patient room rates. The findings show that the magnitude of value between Models 1 and 2 is quite different.

We changed the variables in Models 1 and 2 from the logarithm form of land prices (LnLANDP) to INNER, which represents the location attribute. We estimated Models 3 and 4 using pooled OLS and random effect regression, respectively. We have six variables, including hospitals listed on SET (SET), JCI-accredited hospitals (JCI), hospitals located in the inner area of Bangkok (INNER), the luxury of the living room (Luxury living room), the luxury of bedroom (Luxury bedroom), which have significant effects on patient room rates.

The result shows that most of the independent variables are significantly correlated with the patient room price, except for PRIVATE_nonSET, which is similar to Models 1 and 2. The result of correlation analysis shows that INNER is highly correlated with LnLANDP (74.55%).

However, in this study, we selected INNER as a variable to estimate the patient room price because its value is linearly correlated with the patient room price. Thus, we can interpret the results from Model 4. This might be the appropriate model because we collected the data by observing many room types at the same hospitals. The result can be presented as follows.

CONSTANT represents the base case or medical school, with a coefficient of 730.56. The result implies that medical schools have a predicted patient room price of 730.56 baht per unit.

PRIVATE_nonSET has a coefficient of 176.53. We found that the patient room price of private hospitals increases when compared with medical schools, but the difference is insignificant between this group because private hospitals may or may not have luxury amenities.

INNER represents the hospital located in the inner core of Bangkok, with a coefficient of 2,954.36 (significantly at least 99% confidence level). The result implies that the hospitals located in the inner core of Bangkok will increase their patient room price by 2,954.36 baht per unit from the patient room in medical school. This variable supports the result of previous studies (Laopiroj, 2012), which revealed that the location of condominiums in the city center has a significantly positive effect on the room price because the inner area of Bangkok is the city center containing the office tower, medical facilities, and public transportation. Similarly, people can have more access to healthcare systems when such systems are located in the city center.

SET represents the hospitals listed on Thailand's stock exchange, with a coefficient of 3,573.61 (significantly at least 95% confidence level). The result implies that hospitals listed on SET will increase their patient room price by 3,573.61 baht per unit.

JCI represents JCI-accredited private hospitals, with a coefficient of 2,767.49 (significantly at least 99% confidence level). This supports the results of previous studies (Ismael & German, 2018). In a study, researchers controlled an excellent quality of the hotel by using ratings on TripAdvisor to achieve a higher price. In the case of hospitals, we applied the variable to represent the quality of hospitals by using the JCI standard. The result confirmed that JCI-accredited private hospitals will increase their patient room price by 2,767.49 baht per unit.

Luxury living room represents the luxury of a living room, which contains a sofa, a television, and a dining table, with a coefficient of 7,050.11 (significantly at least 99% confidence level). The result implies that patient rooms with the luxury of a living room will increase their room price by 7,050.11 baht per unit.

Luxury bedroom represents the luxury of a bedroom, which contains a TV, a bed, and a bathroom, with a coefficient of 9,170.80 (significantly at least 95% confidence interval). The result implies that patient rooms with the luxury of a bedroom will increase their room price by 9,170.80 baht per unit. This variable luxury bedroom has a particularly important role in patient room pricing.

Table 3 Estimated results from the hedonic pricing models

Variable	Model			
	model_1	model_2	model_3	model_4
Constant	-16025.75 ***	-13063.18 **	1221.79	730.56
(Based Case-Med School-Outer)				
lnLANDP	1608.41 ***	1350.68 ***		
INNER			2797.34 ***	2954.36 ***
PRIVATE_noSET	1002.36	1258.72	176.53	844.02
SET	2935.22 ***	3498.92 **	2562.7 ***	3573.61 **
JCI	2916.59 ***	2537.17 **	3293.3 ***	2767.49 ***
Luxury living room (0-1)	7618.49 ***	7059.26 ***	7545.51 ***	7050.11 ***
Luxury bedroom (0-1)	9581.04 ***	9241.29 **	9040.15 ***	9170.8 **
N	176	176	176	176
N_g		33		33
F-test	27.44 ***		26.74 ***	
Chi-Square test		190.16 ***		197.19 ***
R-square	0.61		0.60	
R-square_a	0.60		0.59	
R-square_w		0.57		0.57
R-square_o		0.61		0.60

Model: (1) pOLS_lnLANDP (2) RE_lmLANDP (3) pOLS_INNER (4) pOLS_INNER

*Note: *Statistical significance at the 90% level;*

*** Statistical significance at the 95% level;*

**** Statistical significance at the 99% level.*

Conclusions and Recommendations

This research applies the hedonic pricing model to investigate the effects of various characteristics on the patient room price in Bangkok hospitals. The data for this study were obtained from 5 medical schools and 28 private hospitals in Bangkok from the internet and personal interviews with the admission center. The set of attributes include hospital location,

land price, hospital listed on SET, hospital type of (private/medical school), hospital quality, and luxury of the living room and bedroom. However, some attributes (e.g., bathroom, electronic bed, sofa, telephone, television, dining table, dishware, drawer, safety box, and internet access) are present in all private room types of hospitals. Therefore, we excluded these attributes from the set of independent variables. We used the characteristics of the patient room from the luxury of the living room and bedroom, which is different in each room type to evaluate the patient room price. To avoid the multicollinearity problem, some attributes in the patient room were combined into the group using principal component analysis (Ismael & German, 2018).

The results indicate that most factors (i.e., hospital location, land price, hospital listed on SET, hospital type, hospital quality, and luxury of the living room and bedroom) affect the pricing strategy of patient rooms. For example, patient rooms with the luxury of the living room and bedroom in private hospitals located in the inner area of Bangkok, listed on SET, and accredited by JCI standard can charge 27,090.95 baht per unit. The luxury of the bedroom is the most critical factor of the patient room price. The JCI standard, which is the gold standard for private hospitals, is the essential factor that certifies the hospital quality for local and international patients and provides an opportunity for hospitals to charge higher medical costs.

Based on location theory, if the hospital is in a good location, then the land price will be higher. We found a positive correlation between land price and hospitals located in the inner area of Bangkok according to location theory. The land price of urban areas in Bangkok (i.e., Silom, Sathorn, and Sukhumvit) has risen by 10%–20% this year. A previous study indicated that the location of condominiums in the city center has a significantly positive effect on room price because the inner area of Bangkok is the city center, in which office towers, medical facilities, and public transportation are located. Similarly, the fact also applies to hospitals located in the city center, where people can conveniently get access to healthcare systems.

Although healthcare systems are necessary for every Thai citizen, a large difference in room price exists between medical schools and private hospitals. Further research indicates that although location theory states that a good location affects the room price, medical school hospitals are less expensive because of the healthcare subsidy from the government.

Based on asymmetric information theory, foreign patients have little information about hospitals in general. Having JCI standards is an effective way to guarantee the quality of hospitals for patients. Hospitals with JCI standard gain this competitive advantage and consequently can charge more for the room price. This study can be beneficial for private hospitals to implement a strategy to raise their fees accordingly. Thailand is a well-known medical hub in Asia, where foreign patients come only for medical purposes. Thus, hospitals with JCI accreditation have more advantages than those without.

Conversely, medical school hospitals do not have JCI standards because they do not have the business purpose for making profits. This study is supported by the results of previous studies (Ismael & German, 2018). In a study, researchers controlled an excellent quality of hotels by using ratings on TripAdvisor. Thus, hotels on TripAdvisor could raise their room prices because of their credibility.

Regarding the luxury factor, the results indicate that when hospitals add luxuries, such as a living room and a bedroom, the room price increases significantly. The luxury factor also includes additional services for patients. According to Laopiroj (2012), factors contributing to the pricing of condominiums in Bangkok include additional rooms, which affect higher prices.

These findings have important implications for the Public Health Ministry for controlling medical expenses in private hospitals. Data from patient room prices in private hospitals and medical schools have yet to be examined. A study has found that private hospitals overcharge rates above actual costs, including medicine, supplies, and service charges (Arunmas, Apisitniran, & Hick, 2019). However, the Public Health Ministry still cannot impose a policy to regulate medical expenses in private hospitals.

Patients who have access to hospital services domestically and abroad can benefit when the Public Health Ministry imposes a policy to control the medical costs in private hospitals. Moreover, the regulation of patient room prices can potentially promote Thailand as a medical tourism hub for patients outside the country to access medical treatment. This study provides information to the government for efficiently pricing patient rooms among private hospitals and evaluating the monetary support for patients treated in medical school hospitals.

Lastly, for private hospitals, this study will provide thorough information on every essential factor that affects the price setting of patient rooms. This study provides them with

facts, theories, and figures; thus, they will have an understanding of which factors to be considered (e.g., location and type) for pricing hotel rooms in private hospitals. As a result, they could implement further marketing strategies to be more competitive than others. Future works could apply the information in this study to another area outside of Bangkok and including other quality of services. Regarding nursing fees, every patient room in hospitals needs nurses to take care of patients. Hospitals include nursing fees into the patient room price. Thus, separating this particular cost to find the exact correlation of both is complicated. On occasions, the nursing fee for some hospitals may not be extremely high. However, the additional cost, also known as hospital fee, may occur, resulting in cross-pricing, such that the hospital can match the fee with insurance coverage of the patients. Then, hospitals can charge insurance companies instead of patients. In other words, the nursing fee depends on the patient room price of each hospital, which is based on its price setup mechanism. Nursing fee is also included in the service luxury level of the hospital. Private hospitals provide better service than public hospitals in general. Apparently, the higher the price is, the more luxurious and better service will be provided. Therefore, the nursing fee is considered a limiting factor in this study.

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