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THE SPATIAL PATTERN OF ECONOMIC RENTS OF AN AIRPORT DEVELOPMENT AREA: LESSONS LEARNED FROM THE SUVARNABHUMI INTERNATIONAL AIRPORT, THAILAND

Abstract:

With the rise of the importance of air transportation in the 21st century, the role of economics in airport planning and decision-making has become more important to the urban structure and land value around it. Therefore, this research aims to examine the relationship between an airport and its impacts on the distribution of urban land uses and land values by applying the Alonso's bid rent model. The New Bangkok International Airport (Suvarnabhumi International Airport) was taken as a case study. The analysis was made over three different time periods of airport development (after the airport site was proposed, during airport construction, and after the opening of the airport).

The statistical results confirm that Alonso's model can be used to explain the impacts of the new airport only for the northeast quadrant of the airport, while proximity to the airport showed the inverse relationship with the land value of all six types of land use activities through three periods of time. It indicates that the land value for commercial land use is the most sensitive to the location of the airport or has the strongest requirement for accessibility to the airport compared to the residential and manufacturing land use. Also, the bid-rent gradients of the six types of land use activities have declined dramatically through the three time periods because of the Asian Financial Crisis in 1997.

Therefore, the lesson learned from this research concerns about the reliability of the data used. The major concern involves the use of different areal units for assessing land value for different time periods between zone block (1995) and grid block (2002, 2009). As a result, this affect the investigation of the overall trends of land value assessment, which are not readily apparent. In addition, the next concern is the availability of the historical data. With the lack of collecting historical data for land value assessment by the government, some of data of land values and aerial photos are not available to cover the entire study area. Finally, the different formats of using aerial photos between hard-copy (1995) and digital photo (2002, 2009) made difficult for measuring distances. Therefore, these problems also affect the accuracy of the results of the statistical analyses.

Keywords:

Economic rents, Airport development area, Spatial pattern, Thailand

JEL Classification: O18, R58, R28

Introduction

With the emergence of the global economy, air transportation has become more important than ever before. Each year millions of people travel through the world's airports. Decreasing costs of airline travel, competition of airline companies, and the advantages of faster travel time are some of the factors that have given people more opportunities to travel by air than by other modes of transportation. Not only increasing numbers of the passengers but also commodities pass through airports each year. Kasarda (1999) states that the success of businesses will rely not only on the continual improvement of product quality, but also on fast response to distribute these products to customers around the world. Therefore, nations are pressed to build more airports and expand existing ones. Nowadays air transportation infrastructure has become a crucial catalyst for economic growth, creating employment opportunities as well as stimulating trade and commerce. It is abundantly clear that airports now have impacts on the economy at international, national, regional, and urban levels.

As Thailand increases its involvement in the global economy, the capital city of Bangkok faces the urgent need of a new airport (Suvarnabhumi International Airport) to support the growth of the metropolitan area and the national economy. Since the Bangkok has been in a transition period of rapid growth of both population and economic activities, the city is enhancing its role to decentralize into suburban areas. Unfortunately, the expansion of the city is over-controlled, while the real estate developments have converted undeveloped and agriculture land into residential housing projects and golf courses. With the considerable expansion of the city, the growth of suburban and exurban areas in the extended region has been driven not only by the congestion in the core area, but also by government policies, which encourage residents and businesses to decentralize. The intention of the government policy is to relocate manufacturing industries to the east side of the Bangkok Metropolitan Region and to Samut Prakarn province, where the Suvarnabhumi International Airport is located. The area around the airport used to be agriculture lands. Since the plan for the airport was proposed in 1960, the usages of the land have changed over the time, and agriculture land has been converted to industrial and residential developments (Tonmanee and Kuneepong, 2004). These dynamic changes have caused many problems in term of urban sprawl and urban development patterns.

As the result of the rapid growth in economic development and the population in Bangkok, The major problem of the urbanization in Bangkok and the airport development area is the conflicting pattern of urban land use. With the lack of land use regulation and policies, it is very common to find a mixture of various types of land use adjacent to each other. For example, in the eastern region of the Bangkok Metropolitan Area, industrial factories are widespread throughout the area along the major street network (Srinagarindra Road, Wat King-Kaeo Road, Lad Krabang Road, Teparak Road, and Rom Klao Road), and corridor development (Bang Na-Trad Highway), while some of them are located adjacent to residential areas. These situations have increasingly affected the urban settlement patterns as well as the lives of people who live in those areas.

Due to the development of the New Bangkok International Airport, Suvarnabhumi International Airport, the economic impacts of the airport have become very controversial

and much discussed issues. It has had a significant influence on both the surrounding area and the whole region in terms of economic impact, while it has attracted industrial and commercial development that clusters around the airport (Kasarda, 2000). As a consequence, this has led to the increasing of land values around the airport. Since the announcement of the airport in mid 1990s until the beginning of operation in 2006, developers anticipated a tremendous increase in land value. Therefore, the expectation effect led the government to consider providing the infrastructure to support the urban growth in the airport development area in advance of its completion.

Many empirical studies have been conducted on the land use patterns and changes within urban areas, but only a few studies have focused on urban economic development and land use impacts of the airports (Crowley, 1973; Weisbrod, Reed, and Neuwirth, 1993; Hakfoort, Poot, and Rietveld, 2001; Brueckner, 2003; Galoszewski, 2004; Forsyth, 2004; Green, 2006; Flores-Fillol and Nicolini, 2006; and Kasarda, 1999, 2001, 2006, 2009, 2010). Therefore, the objective of this research includes the examination of the impacts of the development of Suvarnabhumi International Airport on land values at the airport and vicinity areas over time. More specifically, this research will seek to evaluate the spatial distribution of the urban activities around the airport, and to determine if the land use activities around the airport have been used efficiently according to the urban land use theory of Alonso (1965). Generally, it is believed that there is a high concentration of commercial activities, some cargoes, and industrial uses around airports. The gathering and clustering of different types of development in terms of residential, commercial, and industrial uses have led cities to expand outward toward and around airport areas, which assumes the airport itself as a new kind of Central Business District, or "aerotropolis" (Kasarda, 2000). The aerotropolis itself should be operated as a multimodal commercial nexus offering varieties of goods and services, such as offices, hotels, and exhibition complexes. The clustering of the businesses will usually occur around the airport and airport corridors (Kasarda, 2010). Therefore, air commerce will have significant impacts on the urban economy and land use patterns because of the revolution of global supply chain management and industrial location decisions. That means firms have found that they can reduce the number of factories and warehouses through air cargo logistics while improving overall performance (Kasarda, 1999). As a result of the competitive advantage through air logistics, therefore, will lead to increased value of land around the airport and the agglomeration of industrial and commercial development in these new economic development areas (Kasarda, 1999, and Flores-Fillol and Nicolini, 2006).

Study Areas

Suvarnabhumi International Airport is located 23 kilometers (14.29 miles) southeast of the Bangkok Metropolitan Area, which is in Bang Phli District, Samut Prakarn province (Figure IV.1). The study area of this research will focus on the radius of 12 kilometers from the airport, while the center is at the passenger terminal. Therefore, the total study area will cover about 576 sq. km (222.4 sq. mile) of surface land. Within the radius of 12 kilometers from the airport, there are five sub-centers, which are in the suburb area of the Bangkok Metropolitan Area, while three of them are southeast of the Bangkok Metropolitan Area and the other two are in Samut Prakarn province. These sub-centers will assume to get the direct impact from the new airport project. The five sub-centers are

Bang Kapi-Hua Mak, Srinagarindra-Bang Na-Trad, Lard Krabang, Bang Phli-Teparak, and Bang Bo-Klong Dan.

Urban Land Use Theory

Alonso's bid rent theory (1964) seeks to determine the location for urban activities based on profit maximization. All urban spaces are occupied by the activities that pay the highest rent and represent the best use of the land. In terms of retail activities, several hypotheses have been proposed about the bid rent theory and the optimal relationships between store types, sizes, rents, sales, and distances from the market center. Since the city center is the most accessible location because of adequate of transportation systems, it offers the maximum market potential and optimum access to sources of labor and consumer. As a result, the most desirable location will go to the highest bidders. Furthermore, the highest rent is charged for land within the city center, and the rents decline the further the distance from the city center (Brown, 1992).

Alonso (1964) argues that the firms trade off between land costs and sales. In addition, they choose locations that maximize profit. A bid rent curve for an urban firm can be defined as the profit that will be deducted from the operating costs and land costs. The location rent of retailing will decline with the increase of the distance from the central business district, which also decreases accessibility and potential profits.   Similar to the agricultural bid rent curve, individual retailers are indifferent to the location along the line, where the profits will be the same everywhere. The profits will be high when moving toward to the center of the city. Therefore, the retailers can afford to bid for the use of land that is close to the central business district.

Moreover, the bid rent curve for industry decreases with the increasing distance from the center of the city, similar to the retailing bid rent curve, but the slope of the bid rent curve is not as steep for retailing. That is because industry does not consider the accessibility as retailing does. Many industrial products are usually sold outside the city, which also reduces the importance of the location within the city (Alonso, 1964).

Furthermore, the bid rent curve for residential land use is the shallowest among the three types of land use. Alonso argues further that households determine their residential locations based on the trade-off between the costs of commuting and land costs, and residents choose their residential locations in order to maximize utilities. Along with the bid rent curve, the price of the land will decrease with the distance from the center because of the advantage of cheaper land located further away from the center. By increasing the distance from the CBD, the household can find more space for living. In comparison with the retailing bid rent curve, it is unlikely that the residential land use is able to outbid retailing because competition in the urban land market in the city center requires greater capital investment and more profit in return. Therefore, residential areas located toward the center of the city are usually characterized by high-density in order to obtain the satisfactory return on investment for residential developers (Alonso, 1964).

In terms of agricultural land use, Alonso points out that the farmer has to pay the rent to the landowner for the land, depending on the profitability of the location. That means the profits that the farmer makes will be shared with the landowner through the rent. Farmers bid for the more profitable locations so that all the farmers can make profit, and then the

profits that have been made will become rent. Therefore, the profit a farmer can make depends on the distance from his land to a market (Alonso, 1964).

Air Transportation and Location of Economic Activities

Since the concept of just-in-time production is the new trend that dominates the global market competition, it is clear that the air-freight industry will play an important role in this coming economic era. Therefore, air commerce will have significant impacts on the urban economy and land use because of the revolution of global supply chain management and industrial location decisions. That means firms have found that they can reduce the number of factories and warehouses through air cargo logistics while improving overall performance (Kasarda, 1999). As a result, the adoption of the just-in-time system causes some manufacturers to relocate their distribution centers close to air transportation facilities in order to provide fast delivery to their customers around the world. With the results of the competitive advantage through air logistics, therefore, will lead to increased value of land around the airport and the agglomeration of industrial and commercial development in these new economic development areas.

The economic activities for development around new or expanded airports can be to identify into two categories: (1) *new activities* and (2*) expansion of existing business activities in the metropolitan area* (Weisbrod, Reed, and Neuwirth, 1993). *New activities* may be attracted from outside the airport area. There is evidence that the prestige of the area and increasing accessibility to air transportation and local transportation facilities also affect the uses of land around the airport area. Since a large commercial airport or international airport affects the economy of the entire region, the new activities may include: regional or national corporate headquarters, trade and merchandise centers marketing retail or industrial products, service companies dependent on air service to reach their market, and airline and related activities. Furthermore, *expansion of activities in the metropolitan area* may occur for many types of businesses, such as users of airport services, suppliers to markets generated by the airport, or businesses that can take advantage of the local transport and other supporting infrastructure developed to serve the airport. These types of activities include high technology electronic equipment manufacturers, communication companies, warehouses and delivery services, and varieties of specialized business services (Weisbrod, Reed and Neuwirth, 1993).

Bid-Rent Model of Urban Land Use around an Airport

The object of the bid rent function approach is to construct an equation for urban land value assessment in each period of time and then to examine the impact of the distance to the airport to ascertain its effect in the equation. The impact variable in this case is the distance to the airport. The bid-rent curve in this model will determine how the distance to the airport affects the land value assessment. Considering that the bid rent model is the foundation of urban land market studies, a number of researchers continue exploring and developing analytical methods to explain the changes in land values according to the significance of the city centers or magnet points. A large number of scholars have insisted on the principal concept of bid rent theory - that the distance to and from the center activities plays a significant role in influencing prices of land. The concept of bid rent stems from the well-know economist, von Thünen (1826). His study primarily focused on analyzing the pattern of land use and land values in agriculture area by using the

concept of economic rent to explain the distribution of various agriculture land uses around the market. Later, Alonso's studies (1960, 1964) used the same concept to create the formal model by generating a series of land use zones from the intersection of different bid rent curves according to the discussion in chapter 2. Also, Warren Seyfield (1963) conducted a study of Seattle based on Alonso's urban land use theory to examined whether the values of land increased as the distance to market center increased and the accessibility decreased. In 1972, Edwin Mills conducted a study of the density functions associated with the different types of land use patterns for 18 U.S. Metropolitan Areas. The result supports Alonso's study of 1964 with the averages density gradients associated with each type of land use through out the four periods of time indicate the density gradient of the retailing is the steepest.   That means retailing dominates the central city location compared to the residential land use, which dominates the peripheral locations.

Later in 1982, Ashok K. Dutt and Abdullah Al-Mamun Khan did a study on the urban land values of Akron, Ohio. This study examines the spatial relationships between assessed land values and selected variables, which include the distance to the Central Business District (CBD). Finally, Ricardo Flores-Fillol and Rosella Nicolini (2006) did a study to examine the conditions allowing for the formation of aerotropolitan areas as large industrial areas with a high concentration of the commercial activities in the area surrounding of passenger and cargo airports. In this study the distance to the airport will be used to determine the changes in location rents of firms and service operators for both types of airports.

Since the site of the airport was proposed in 1991, the model of bid-rent function will be constructed in three time periods (1995, 2002, and 2009). Therefore, the six bid-rent models are based on the six different types of land use. The bid-rent model for each type of land use in this analysis could be specified in the form:

$$LV_i = \alpha + \beta(Dist.AIR) + \varepsilon \qquad\qquad (1)$$

where LV is land value assessment; i is a type of land use; Dist.AIR is Distance to the airport; α is constant to represent the value that intercepts at the Y-axis; β is the regression coefficient to represent the slope of Dist.AIR; and ε is error term.

In urban and real estate economic literature, it is common to assume that the relationship between dependent and independent variables is non-linear. The form of the log transformation is more appropriate for the analysis of the multivariate urban land value and multivariate housing value model according to the previous studies (Yeates, 1965; Nelson, 1980, 2003; Asabere, 1981; Ferguson, 1984; Peiser, 1987; Debrezion, Pels, and Rietveld, 2003; McMillen, 2004; Rahmatian, and Cockerill, 2004; Kim, Park, and Kweon, 2007; Ahlfeldt, and Maennig, 2007; Cebula, 2009). Therefore, the log transformation will be applied to both sides of the equation in order to reduce the value of residuals. The log transformation equation is represented in the function form as follows:

$$\ln(LV_i) = \alpha + \beta_1 \ln(Dist.AIR) + \varepsilon \qquad\qquad (2)$$

Results

The Spatial Pattern of Airport Economic Rent: Regression Results

The overall research objective is to examine the relationship between the land values of six types of land use and the location of Suvarnabhumi International Airport. The Alonso bid-rent model is appropriate only for the northeast quadrant to estimate the impact of the airport on the land value with no interference from the access to CBDs and other exogenous factors, such as transportation costs and site characteristics.

Table 1: Log Linear Regression for Parameters of Bid-Rent Function

Parameter Estimates of Bid-Rent Function for Northwest Quardrant

Land Use	1995			2002			2009		
	β	t	F	β	t	F	β	t	F
Agriculture	0.179	2.077	4.312	NA	NA	NA	NA	NA	NA
Low-Density Residential	0.798	16.269	264.693	0.555	11.423	130.393	0.436	9.709	94.262
High-Density Residential	0.587	4.975	24.747	0.383	5.621	31.388	0.326	4.784	22.766
Commercial	0.891	8.360	69.886	0.529	8.039	64.626	0.483	7.280	53.148
Manufacturing & Warehouse	0.482	5.552	30.828	0.431	7.154	51.174	0.394	6.982	48.747
Vacant Land	0.727	10.315	106.396	0.435	7.673	58.870	0.427	6.769	45.821

Parameter Estimates of Bid-Rent Function for Northeast Quardrant

Land Use	1995			2002			2009		
	β	t	F	β	t	F	β	t	F
Agriculture	-1.421	-15.982	255.415	-1.014	-10.884	118.468	-1.312	-12.772	163.127
Low-Density Residential	-0.656	-7.203	51.880	-0.601	-4.880	23.817	-0.886	-8.202	67.275
High-Density Residential	-2.876	-7.012	49.170	-0.631	-3.063	9.382	-0.602	-4.501	20.260
Commercial	-3.154	-11.627	135.188	-1.035	-8.852	8.359	-0.958	-7.741	56.859
Manufacturing & Warehouse	-1.123	-4.574	20.923	-0.552	-2.752	7.576	-0.341	-2.450	6.004
Vacant Land	-1.609	-12.431	154.521	-1.390	-10.878	118.321	-1.047	-7.933	62.934

Parameter Estimates of Bid-Rent Function for Southwest Quadrant

Land Use	1995			2002			2009		
	β	t	F	β	t	F	β	t	F
Agriculture	0.176	2.058	4.234	0.483	3.656	13.364	0.781	5.660	32.404
Low-Density Residential	0.593	7.246	52.507	1.102	9.379	87.965	1.059	9.996	99.922
High-Density Residential	NA	NA	NA	0.468	2.913	8.487	NA	NA	NA
Commercial	-0.796	-2.746	7.539	NA	NA	NA	NA	NA	NA
Manufacturing & Warehouse	NA	NA	NA	0.208	2.322	5.390	0.277	3.236	10.470
Vacant Land	NA	NA	NA	0.985	8.485	71.988	1.180	9.432	88.961

Parameter Estimatess of Bid-Rent Function for Southeast Quadrant

Land Use	1995			2002			2009		
	β	t	F	β	t	F	β	t	F
Agriculture	NA	NA	NA	0.699	6.156	37.900	0.294	2.482	6.120
Low-Density Residential	0.579	7.833	61.359	0.663	5.937	35.245	0.771	5.840	34.111
High-Density Residential	NA	NA	NA	NA	NA	NA	NA	NA	NA
Commercial	NA	NA	NA	2.760	3.139	9.851	2.784	3.833	14.693
Manufacturing & Warehouse	0.839	3.862	14.914	1.604	7.669	58.808	0.951	3.298	10.875
Vacant Land	1.204	3.341	11.165	NA	NA	NA	0.901	2.308	5.325

α = 5 percent level
Dependent variable is LN(Land Value)
Independent variable is LN(Distance to Airport)
NA is nonsignificant statistical result

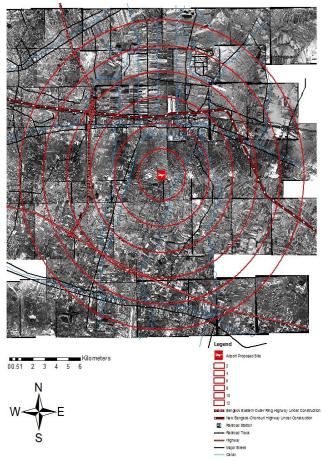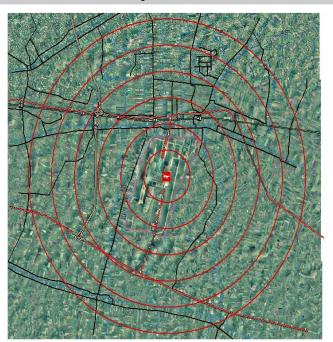**Figure 1: Suvarnabhumi International Airport Study Area, 1995**

According to Table 1, the statistical analysis results of the model indicate the strength of this model, especially for the northeast quadrant, where the proximity to the airport provides a negative impact on the values of all six types of land use with the significance of F-statistic and R-square throughout three periods of time; the period after proposed airport site (Figure 1, 1995), the period of airport construction (Figure 2, 2002), and the period after the opening of the airport (Figure 3, 2009). Furthermore, the gradients for commercial land use ($\beta_{1995} = -3.15$, $\beta_{2002} = -1.035$, $\beta_{2009} = -0.958$) are the steepest among the six types of land uses through the three time periods. This result indicates that the land value for commercial land use is most sensitive to the location of the airport or has the strongest requirement for accessibility to the airport compared to the high-density residential ($\beta_{1995} = -2.876$, $\beta_{2002} = -0.631$, $\beta_{2009} = -0.602$), low-density residential ($\beta_{1995} = -0.656$, $\beta_{2002} = -0.601$, $\beta_{2009} = -0.886$) and manufacturing land use ($\beta_{1995} = -1.123$, $\beta_{2002} = -0.552$, $\beta_{2009} = -0.341$).

Moreover, the characteristics of the land use and the geographical constraints of the area can affect the prices of land for the northeast quadrant. Most of the land on the far side of northeast quadrant has been preserved for agriculture land and in some area is a flood plain area. Therefore, the prices of land on the far side of the northeast quadrant have not increased very much as compared to the area close to the airport. In terms of the land use characteristics, the area of the Lad Krabang sub center has generated intense development of commercial and residential activities because of the attractiveness of the King Mongkut's Institute of Technology, which opened in 1971. After the new airport project had been announced in 1995, developers began speculating on the land around the airport for future development. Therefore, the prices of land around the airport reflect the new airport project along with the increasing development around the King Mongkut's Institute of Technology.

Figure 1:
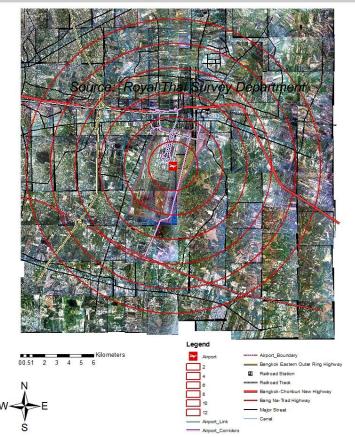

Suvarnabhumi International Airport, Study Area 2002

Figure 2:

Suvarnabhumi International Airport, Study Area 2009

Source : Royal Thai Survey Department

In addition, the bid-rent gradients of the six types of land use activities decline dramatically through the three time periods because of the Asian Financial Crisis in 1997 and its impact on Thailand's economy. Because this crisis resulted in the decline of industrial businesses (β_{2002} = -0.552, β_{2009} = -0.341) in the area, in 2002 and 2009 the low-density residential land (β_{2002} = -0.601, β_{2009} = -0.886) outbid the manufacturing and warehouse land for locations closer to the airport. Furthermore, the eighth and ninth national economic development plans (1997-2001 and 2001-2006) promoted the area in Samut Prakarn province, south of the airport, to become an industrial zone. Therefore, the industrial businesses tended to relocate their plants to the area where the labor supplies are sufficient and government policies support their businesses.

On the other hand, for the northwest, southeast, and southwest quadrants, the results of the bid rent model are not supported by Alonso's urban market theory. The results of bid-rent model for these three quadrants indicate the positive impact of the airport on the urban land value, which is opposite to what Alonso stated in his theory. The reasons for these positive impacts may be derived from the effect of exogenous factors that affect the prices of land and make the proximity to the airport become a positive impact on the land values, which make proximity to the airport become less significant or insignificant for some types of land use.

Also, the result of the positive impact can be explained by the intensity of the existing developments in the area of three quadrants of the airport area such as; Ramkamheang and Bang-Kapi market and along the Bang Na-Trad highway. These developments occurred more than thirty years before the airport project, and they caused increasing density in the area. Therefore, the prices of land in the area of Ramkamheang, Bang-Kapi market, and along Bang Na-Trad highway have increased in the last thirty compared to the airport area. Although the Suvarnabhumi International Airport is a mega project that attracts many developments to the area, the impact of the proximity to the airport is still overwhelmed by the proximity to the transportation arterials and high-density of the core area.

Discussion: Lessons Learned from the Airport

The lesson learned from this research concerns about the reliability of the data used in this research. The first concern involves the use of different areal units for assessing land value for different time periods. While the land value assessments for 1987 and 1995 were conducted for zone block, the land value assessments for 2002 and 2009 were conducted for grid block. The Treasury Department of the Ministry of Finance was responsible for using two different areal units for conducting land value assessment. Clearly, this may affect the investigation of the overall trend of land value assessment, which is not readily apparent. However, the large sample sizes of land value data for each land use activity, quadrant, and time period used for the statistical analysis should overcome whatever impact the use of different areal unit the land value data may have.

A second concern for this research is the availability of the historical data. With the lack of historical data format for land value assessment by the Thai government, most of the

historical land value assessments are in a paper-based format. Therefore, some of them have been lost, and some of them are damaged. Since the study area covers about 576 sq.km (222.4 sq. mile) of surface land, the data of land value assessments have to be collected from more than 10,000 pages of hard copies. However, some of data of land values are not available because of the lack of historical data from the Treasury Department of the Ministry of Finance. Missing land value data in some areas may affect the accuracy of the results of the analyses.

A third concern involves the availability of aerial photos for the study. Since the study area is very large, it was difficult to find aerial photos that covered the entire study area. The aerial photos of 1987 and 1995 were in hard-copy format and were in a different scale. By using digital aerial photos of 2002 as the base map, which included the coordinate system in the map, the aerial photos of 1987 and 1995 were scanned and overlayed on the base map of 2002 by using a GIS program. The different aerial photo formats caused a distortion of the picture when overlaying pictures on the base map. The results of the distortion made it difficult for measuring distances.

However, the results of the bid-rent model can determine the impact of the airport on each type of land use, and the Thai government can then use these results to plan the infrastructure and public utilities to support growth in the area. In general, the public also benefits directly from better planning decisions made by authorities and by the judicious allocation of public money for facilities to support the uses of land in the area. For example, if the location closer to the airport is suitable for commercial businesses, the government can prepare the land, public utilities, public transit, and policies to encourage commercial developers to build their businesses in the designated area. Furthermore, if the land farther away from the airport is suitable for the manufacturing and warehouse, the government may encourage industrial businesses to relocate their facilities to the desirable areas by providing the suitable land, infrastructure, policies, and intensive programs. Additionally, real estate developers can use the findings of this research as a tool to determine the best location for profitable developments.

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