

# The Selection Factors of Reused Old House in Tainan Historical Districts: A Case Study of Commercial Use of the Old Houses

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**Abstract:** *The atmosphere of reused old house in Tainan began to flourish since 2008. The numbers of reused old house are rising continuously in Tainan till now. The ways of operation are variety, most of them were used as a business place, like coffee shop, restaurant, handmade work shop and studio. This research is to discuss what factors prompted these proprietors to choose the old houses to reuse. Even though the researches past deeply know the situation of the subjects with the method of Qualitative Research but they couldn't understand the phenomenon of whole Tainan historical districts because they all focus on specific areas or streets before. Therefore the study will discuss the selection factors of reused old house in Tainan historical districts by hedonic price model. Two research objectives are as follows:*

- 1) *By comparison of economic viewpoints and general site selection factors, whether the situation of the selection factors of reused old house in Tainan historical districts is a special case?*
- 2) *According to the implying meaning of rent by Hedonic Price method, the study will try to analysis which factors would proprietors consider for the old house reused*

**Keywords:** *reused old houses, selection factor, Tainan historical districts, hedonic price model*

## 1. Introduction

The cultural atmosphere is made up of monuments, old alleys and old houses. Comparing with the monuments and gorgeous old houses, the general old house is much more close to lives of ordinary people and the basic atmosphere of the Tainan historic district. Therefore, the old houses perform the process of Tainan history. As the development, the old houses become idle or torn down. However, the public begins to respect, preserve and reuse the old houses since the government implements the Cultural property conservation law and subsidy about reused old houses.

The motivation is to know what factors caused the proprietors to choose the old houses to reuse in commercial way. The researches past deeply know the situation of the subjects including the selection factors with the method of Qualitative Research. They limited to the specific areas or streets so that they couldn't understand the thinking of the whole proprietors in whole historical districts. The reason why choosing the reused old house in commercial is that there are at least 1000 old houses in this area but not all of them were reused. Most reused old houses were commercial use except for traditional shop. The proprietors most of them are young create new functions and make the old house keep working in new form like coffee shop, restaurant, handmade work shop and studio. The new way of using old house let the life of the old houses be extended.

The research tries to use hedonic price model to analyze the selection factors through the implied meaning of the old houses' rent and to compare reused old houses' selection factors with the normal shop sites' selection factors. Taking the whole Tainan historical district as the area of research is to understand the general selection factors of reused old house. After the field study, there are 145 reused old houses in the area.

## 2. Literature Reviews

According to the Tainan City Historic District Revitalization Autonomy Ordinance, the definition of the old house is a building full of history, culture and preservation value or had been built before 1971. 《Encyclopedia of Architecture, Design Engineering & Construction》 had made the definition of reuse: by creating a new functions or reconfiguration let the building to continue to use in new way which could meet its demand. A reused old house allows us to see the value of its past and turn it into new energy(Ya-Jyun Lin , 2011).

The atmosphere of reused old houses in Tainan began to flourish since 2008, then more and more related researches have been output. Most of them illustrate the old houses are the basis for the historical atmosphere of Tainan. While paying attention to the history and culture of Tainan, we should not just focus on the monuments but also the old houses. Old houses are the stories, ideas and memories. Jane Jacob mentions urban diversity is of great importance, only in combination do they lead to the diversity that is needed for a blossoming city life. The core of process about reused old house is the owner of the old house, and the proprietors will be normed by the owner. Because of the traditional thinking of inheritance, most of the reused old houses were rented. The reused old houses locate on alley more than street and road. The selection of reused old house is different from the selection of shop site. There is no more crowded and traffic but relies on the type of old houses and the environmental atmosphere (Jin-ling Jan,2014 and Szu-Wen Fang, 2015). Location and area which impact the proprietors are the important selection (Hsien-Hsien Cheng, 2013 and Su-Han Tsai, 2016).

According to Principle of Minimum Differentiation and Bid Rent Theory, the proprietors must choose the site which could get the greatest benefits. Also, the different industries would choose different site. The factors are different from the factors of reused old house, including population, consumption, environment, competition, cooperation, traffic, location, legal and financial.

The hedonic price model based on consumption theory was developed by Lancaster(1966). If we discuss the hedonic price of the house price we could know the relationship between people and market. We can understand people's preference of the environment by regression model. Lots of researchers use the hedonic price model to discuss on interpreting environmental factors which influence the rent, house price or land value.

## 3. Research Design

### 3.1. Research procedure

The research will be divided into three sections. The first one is the basic data collecting and the related literature analyzing, in order to build the basic research infrastructure. Second, to use the hedonic price model and the last is to write the conclusion and advice. The procedure is shown below.

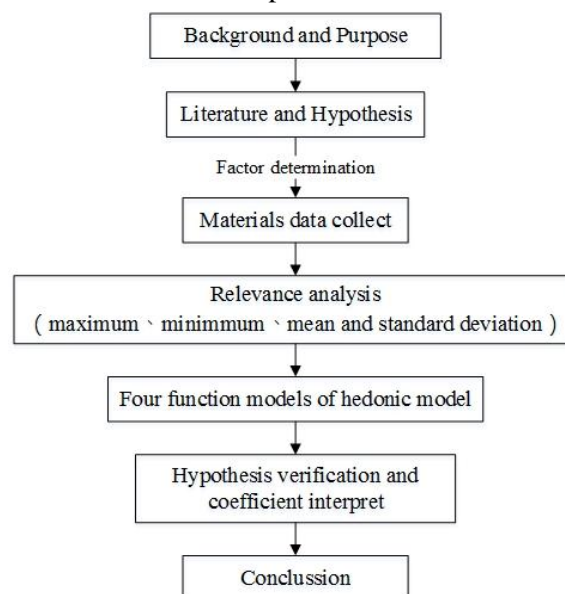


Fig. 1 procedure

### 3.2. Research Method

The necessary factors will be gotten by field research and they will be divided into general site selection factors and reused old houses' selection factors. Afterwards, it will use four regression model of hedonic price model linear, semi-log, inverse semi-log and log-linear. By comparing with each other, the best model will interpret the meaning of coefficient and preference of proprietor by analyzing the factors on rent.

### 3.3. Research hypothesis

The hypothesis will be divided into general site selection factors and reused old houses' selection factors. According to the literatures, the general site selection factors are not the priority of the proprietors' selection. It doesn't depend on lots of people and traffic but on the type of old house and atmosphere of environment. So the hypothesis shows below:

- *General site selection factors*  
 H1: If the environment around the old house is busier, the proprietors will not use the old house.  
 H2: If the general site selection factors is more superior, the proprietors will not use the old house.
- *Reused old houses' selection factors*  
 H3: If the frontage and building type of old house is more brilliant, the proprietors will use the old house.  
 H4: If the historical atmosphere surround is stronger, the proprietors will use the old house.
- *Other selection factors*  
 《The analysis of the historical building reusing in Kaohsiung》, Hsien-Hsin Cheng(2013) and Su-HanTsai(2016) points out the historical old houses are in the prime location of the city. The location, area and land value are the important factors. Consequently, the study will preliminary study the relationship between reused old houses' selection factors and land value.

### 3.4. Variable setting

Based on the hypothesis above, the variables will be set as the following. Under Chinese traditional concept of inheritance, the reused old houses are mainly based on rent (Ya-Jyun Lin , 2011). Therefore the Dependent variable of the study will be rent.

TABLE I: Variable Setting

	<i>Variable name</i>	<i>Variable code</i>	<i>Description</i>	<i>Unit</i>
Dependent variable	Rent	Rent	The rent of old house	Ten thousand dollar
General site selection factors	Year tourist number	Tour_n	The annual tourist number of sightseeing spot nearest to the old house	Ten thousand people
	Frontage width	B_wide	How wide the frontage width of the old house is	Meter
	Road width	Road_w	How width the road in front of the old house is	Meter
	Distance to main road	Mroad_d	The distance between the old house and the nearest main road	Meter
	Distance to bus stop	Bus_d	The distance between the old house and the nearest bus stop	Meter
	Distance to parking lot	Parking	The distance between the old house and the nearest parking lot	Meter
Reused old houses' selection factors	Building type	B_formCS	Whether it is the Qing street house or not. (Yes:1, No:0)	Dummy variable
		B_formCH	Whether it is the Qing Pan-Lou-Tzu building or not. (Yes:1, No:0)	
		B_formCC	Whether it is the san ho yuan or not. (Yes:1, No:0)	
		B_formJS	Whether it is the Japanese street house or not. (Yes:1, No:0)	
		B_formJR	Whether it is the Japanese residence or not. (Yes:1, No:0)	
		B_formJD	Whether it is the Japanese dormitory or not. (Yes:1, No:0)	
		B_formRS	Whether it is the post-war street house or not. (Yes:1, No:0)	

	<i>Variable name</i>	<i>Variable code</i>	<i>Description</i>	<i>Unit</i>
		B_formRC	Whether it is the post-war congregate housing or not. (Yes:1, No:0)	
		B_formRR	Whether it is the post-war residence or not. (Yes:1, No:0)	
		B_formRP	Whether it is the post-war public building or not. (Yes:1, No:0)	
		B_formO	Whether it is the other building type or not. (Yes:1, No:0)	
	Building age	B_age	How old the old house is	Year
	Building facade	B_look	How splendid the facade of the old house is (3:Spendid, 2:pretty good, 1:common)	Dummy variable
	Distance to monument	His_d	How far the distance between the old house and the nearest monument is	Meter
	Distance to old street	Opath_d	How far the distance between the old house and the nearest old street is	Meter
	Monument number	His_n	How many monuments surround old house	Unit
	Old house number	Oh_n	How many reused old houses surround old house	Unit
Other selection factor	Land value	Landvalue	How much land value of the location of the old house is	Ten thousand dollar

#### 4. Data Analysis

The samples are based on the old houses which had been reused before 2016/10. After the field research, there are 145 reused old house in Tainan historical districts. As the Fig. 2 shows, most of the reused old houses spread out the streets or blocks. According to the overlay, the streets appeared during the modern urban planning of Tainan city under the Japanese rule, like Zhongzheng Road, Zhongshan Road and Minquan Road.

Most of reused old houses were used by rented and the average of the rent is about 25,000 thousand/month. The maximum of the rent is 68,600 thousand/month. The year tourist number refers to the statistical data of Tainan government and the sightseeing spots include Tainan Grand Matsu temple, Confucious Temple, Chihkan Tower, Koxinga Shrine and The Si Dian Wu Miao. The average of the year tourist number is about 560,000 and the maximum is 840,000. In addition, the relationship between reused old houses and roads can be discovered by Autocad and ArcGIS. The average width of road or street in front of reused old house is 9.8 meters and the average of distance to main road is 82.3 meters. The average distance to bus stop is 85.4 meters. The nearest is 6 meters and the farthest is 250 meters. The average distance to parking lot is 221.8 meters. According to the research of Government, the optimum walking distance is about 400-800 meters, so the distance of bus stops and parking lots are still within the scope. The average width of the frontage is about 5.8 meters and the average of age is about 66.9 years. The reused old houses and the monuments are very close. The average distance to monument is about 81.6 meters and the average number of monuments surrounding reused old house is about 14.9. The maximum is 30, thus we can find that the density is very alarming. Most reused old houses are close to the old streets and the average distance to Old Street is 20 meters. The number of the reused old houses surrounding it is about 7.9. On the other way, the average of the land value is about 79,000. The maximum is 191,000 and the minimum is only 27,000.

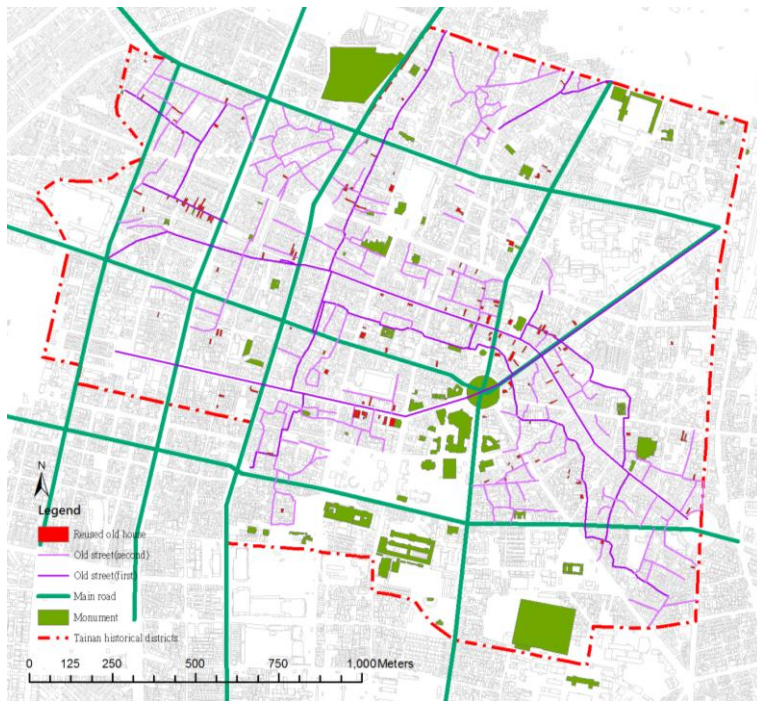


Fig. 2 Reused old houses distribution map

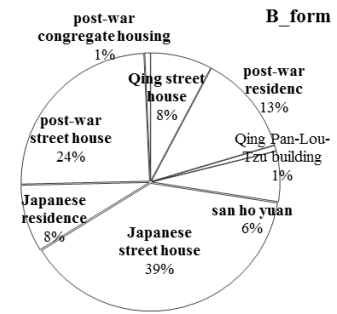


Fig. 3 B\_form charts

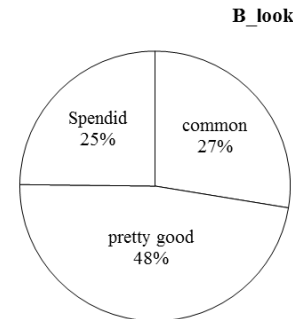


Fig. 4 B\_look charts

TABLE II: Reused old house statistics

<i>Variable name</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Standard deviation</i>
Rent	.00	6.86	2.5721	1.48188
Tour_n	21	84	56.27	23.213
B_wide	2.30	19.00	5.8869	2.86585
Road_w	.00	23.60	9.8745	7.78525
Mroad_d	7	275	82.32	57.537
Bus_d	6	250	85.49	48.214
Parking	18	591	221.80	111.059
B_age	45	121	66.97	21.132
His_d	0	324	81.63	60.779
Opath_d	0	266	20.08	40.073
His_n	1	30	14.93	8.184
Oh_n	5	67	37.48	13.944
Landvalue	2.71	19.13	7.9394	4.52795
Reused old house total				145

Japanese street house is the largest proportion of the building type and it is about 39%. The second is the post-war street house(24%) and the third is post-war residence(13%). In Building facade section, “pretty good” is the largest proportion and it is about 48%. It is surprising that “spendid” is the last and it is only 25%.

## 5. Regression Analysis

TABLE III: Regression of Hedonic price model

	<i>linear</i>		<i>Semi-log</i>		<i>Inverse semi-log</i>		<i>log-linear</i>	
	<i>t</i>	<i>Sig.</i>	<i>t</i>	<i>Sig.</i>	<i>t</i>	<i>Sig.</i>	<i>t</i>	<i>Sig.</i>
constant	1.919	0.057	-2.020	0.045	1.537	0.127	2.626	0.01
Tour_n	1.118	0.266	1.536	0.127	1.461	0.147	1.367	0.174
B_wide	0.376	0.707	0.097	0.923	-0.170	0.865	0.250	0.803
Road_w	0.827	0.410	0.156	0.877	0.997	0.321	0.702	0.484
Mroad_d	-1.078	0.283	-0.838	0.404	-0.892	0.374	-0.911	0.364
Bus_d	1.335	0.184	0.268	0.789	1.594	0.113	0.100	0.921

	<i>linear</i>		<i>Semi-log</i>		<i>Inverse semi-log</i>		<i>log-linear</i>	
	<i>t</i>	<i>Sig.</i>	<i>t</i>	<i>Sig.</i>	<i>t</i>	<i>Sig.</i>	<i>t</i>	<i>Sig.</i>
Parking	0.602	0.548	2.111	0.037**	-0.221	0.826	2.073	0.040**
B_formCS	-0.522	0.603	-0.921	0.359	-0.685	0.495	-0.848	0.398
B_formCH	-0.316	0.752	0.103	0.918	-1.133	0.259	-0.007	0.994
B_formCC	-1.316	0.191	-0.387	0.699	-1.731	0.086*	-0.415	0.679
B_formJR	-0.584	0.561	0.121	0.904	-0.609	0.543	0.423	0.673
B_formRS	-0.007	0.994	-0.114	0.909	-0.331	0.741	-0.059	0.953
B_formRC	-1.270	0.207	-1.693	0.093*	-1.769	0.079*	-1.630	0.106
B_formRR	-1.258	0.211	-0.731	0.466	-1.430	0.155	-0.694	0.489
B_age	0.607	0.545	0.321	0.749	0.854	0.395	0.379	0.706
B_look	-0.641	0.523	-1.102	0.272	-1.133	0.260	-1.015	0.312
His_d	-5.155	0.000***	-4.527	0.000***	-5.072	0.000***	-4.605	0.000***
Opath_d	-2.421	0.017**	-2.958	0.004**	-2.487	0.014**	-2.923	0.004**
His_n	0.008	0.994	0.704	0.483	-0.048	0.962	0.506	0.614
Oh_n	0.040	0.968	-0.202	0.840	0.008	0.993	-0.054	0.957
Landvalue	1.857	0.066*	2.941	0.004**	1.513	0.133	2.401	0.018**
F		4.318		4.780		4.542		4.541
R		0.641		0.660		0.650		0.650
R2		0.411		0.435		0.423		0.423
Adj R-sq		0.315		0.344		0.330		0.330
sample		145		145		145		145

a. SPSS excludes the variable B\_formJS in all four models

b. \*\*\*, \*\*, \* represent the significance level of 1%, 5%, 10% respectively

After the SPSS analysis, the variables of the study don't have the situation of collinearity (VIF < 10). The best model of all is Semi-log model and its R2 is 0.435. According to table IV, the R2 of the Semi-log model is enough to be dependable.

TABLE IV: R2 explanation parallel text

Sample Size	<i>Significance Level ( α)=0.01 No. of Independent Variables</i>				<i>Significance Level ( α)=0.05 No. of Independent Variables</i>			
	2	5	10	20	2	5	10	20
20	45	56	71	NA	39	48	64	NA
50	23	29	36	49	19	23	29	42
100	13	16	20	26	10	12	15	21
250	5	7	8	11	4	5	6	8
500	3	3	4	6	3	4	5	9
1,000	1	2	2	3	1	1	2	2

a.NA=not applicable

b. Source:Multivariate Data Analysis sixth Edition, Joseph F. Hair, Jr(2005), P.195

The Regression formula of reused old house is as follows:

$$\begin{aligned}
 Rent = & -2.02 + 1.536Tour_n + 0.097B\_wide + 0.156Road\_w - 0.838Mroad\_d - 0.838Bus\_d \\
 & + 2.111Parking - 0.921B\_formCS + 0.103B\_formCH - 0.387B\_formCC \\
 & + 0.121B\_formJR - 0.144B\_formRS - 1.693B\_formRC - 0.731B\_formRR \\
 & + 0.321B\_age - 1.102B\_look - 4.527His\_d - 2.958Opath\_d + 0.704His\_n \\
 & - 0.202Oh\_n + 2.941Landvalue
 \end{aligned}$$

The preliminary research results shows part of the selection factors are the same as past but most of them refute. The Consistent part is that the proprietors prefer Qing Pan-Lou-Tzu buildings and Japanese residences. The age of the building is the older the better. The proprietors all like the atmosphere of historical environment and the component of the atmosphere of historical environment are monument, old house and Old Street. If the old houses are closer to monuments and old streets, the proprietors more likely reuse the old house. The assume H4 is valid.

The inconsistent part is that the proprietors still consider the general site selection factors. The proprietors



prefer wider road and frontage, closer to main roads and bus stops. The number of tourist is the bigger, the better. But they want to stay away from the parking lots. On the part of reused old houses' selection factors the building facade shows negative correlation. There may be two reason. If facade is more splendid, the funds of maintenance and management will be higher. On the other way, the judgement of facade is a profession. An old house has lots of components. The proprietors can't judge them, they still based on their own feelings. The

proprietors want to use the reused old house in the surrounding is the less the better. It can be interpreted that

they want to avoid industry competition. All of them are the same industry and the theme of the old house atmosphere are the same. Based on the result the assume H1, H2 and H3 are invalid.

In addition, the reused old houses can be found on the site which the land value is higher. The overlay of land value and rent can be seen that the areas with high rent overlap with the high land value. But there are some area with high rent overlap with the low land value. The situation is similar to the research result of Shu-Li Huang, it points out that the atmosphere of reused old house flourish. It begins to excessive commercial speculation and cause the rent has been raised. However, this study is an only preliminary found in this phenomenon, it can't be in-depth study.

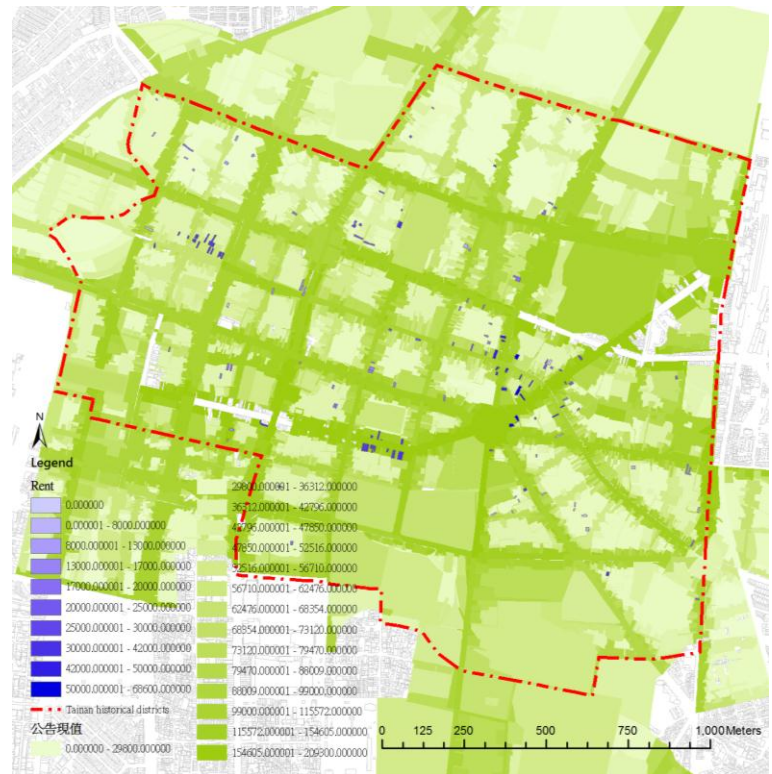


Fig. 5 Rent and Land value distribution map

## 6. Conclusion

The study uses the Hedonic price model which is the Quantitative methods to discuss the whole Tainan historical districts. It can complement the defect of the researches past which were studied in specific areas. The specific areas include Xinmei Street, Xinyi Street or Shennong Street and all of them are flourishing areas. Consequently, the research result past can't interpret the phenomenon the reused old house in Tainan historical districts.

According to the result, the proprietors prefer the old houses with historical and cultural atmosphere of the area. The monuments around are significant. The proprietors may consider the general site selection factors including near main roads, bus stops and lots of tourists. This part of the discovery is the biggest difference with the research in the past. In addition, discussing with the land value can discover that the reused old houses locate the site with the higher land value.

The result presently can't do a more detail discussion with the factor. For example, the study takes all monuments as homogeneity. In fact, the monuments can be separated into several types. The location of reused old houses can separate into road, street and corner. There can be much more selection factors to discuss with, even. It includes the structure of building, land use and the distribution of old trees or Furui. So that it can have more in-depth and extensive discussion of the selection factors of reused old houses.

Some selection factors have the problem of time course like land value. The result presently can only interpret the relationship between land value and rent but it can't interpret why the reused old house locate in the area with the higher land value. It is necessary to examine and classify the selection factors which also have the problem of time course. So that it could understand the thinking of proprietors through the time changing.

In addition, many researches point out that Hedonic price model has the problem of Spatial Dependence. Subsequent studies may detect the spatial autocorrelation (Moran's I) with the rent. Whether the dependent variable of the model has Spatial Dependence or not. If it has the problem, it will use the Spatial Hedonic price model to enhance the explanatory power of the model.

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