

# Correlation Between Location, Area and Price of the Private Condominium in Three Major Metropolitan Areas of Taiwan

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# Correlation Between Location, Area and Price of the Private Condominium in Three Major Metropolitan Areas of Taiwan

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## Abstract

Under the economic depression of Taiwan, the housing development was decreased, and the scale of developer was also become small. Because the discontinued practice has become the mainstream, the scale of project has become smaller and tinier, too. These will influence the resident standard heavily.

Based on the background above, the purpose of this paper is to analyze the area and price of private condominium from the viewpoint of location. We examined these from two parts of housing unit and project unit, and analyzed cross with the indexes about the housing form, the purpose of project, and the scale of developer. About the method of analysis, each metropolitan area was divided into 5 radiuses per 5km from the center station, and we focused on the effect of distance by a micro viewpoint.

From these analyses we found the location characters on the numbers of project, the composition of developer's scale, the composition of housing form, and the composition of project's purpose. Next, we also found the characters on the housing unit price, the housing price, the site area, and the total housing price are different by the distance. However, those characters are not the same in three metropolitan areas. We summarized the characteristic of each metropolitan area in this paper.

## 1. Introduction

Although both of them are in East Asia, the housing situations of Taiwan are different from Japan. The characteristics of Taiwan are that there are few detached houses, but many row houses and apartment houses, and the mainstream is privately-owned house of condominium by the private developer. We have presented some papers to examine these. One is the paper about the regional characteristic of Taiwan on the trend of population, housing and construction. And another paper about the numbers, density, developer's scale and project's purpose of the private condominium in three major metropolitan areas of Taiwan. From the studies above we knew that under the economic depression of Taiwan, the housing development was decreased. The scale of developer was also become small, and because of the discontinued practice has become the mainstream, the scale of project has become smaller and tinier, too. These situations will influence the housing standard heavily.

Based on the background above, the purpose of this paper is to analyze the area and price of private condominium from the viewpoints of location. We examined these from two parts of housing unit and project unit. And we analyzed cross with the indexes of the housing form, the purpose of project, and the scale of developer. We used the data of "Housing Market Year Book (1991-2000)" which published by "Real Estate Investment Asso-

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ciation of Foundation" in each of the three major metropolitan areas of Taiwan. The numbers of project for analysis is 11086 in total. This study was divided into "housing unit" and "project unit" about the analysis item. In the chapter of "housing unit", we analyzed the correlations between housing area and housing unite price, and the correlation with location respectively. And in another chapter of "project unit", we analyzed the correlations between the site area and project's total housing price, and the correlation with location respectively. About the method of analysis, the metropolitan area was divided into 5 radiuses per 5km from the center station, and we focused on the effect of distance by a micro viewpoint.

## 2.Outline of three major metropolitan areas

### 2-1.Regional characteristic of three major metropolitan areas

Table 1 shows the outline of population in three major metropolitan areas. Taipei metropolitan area is the most urbanization region, although Taipei city is the capital of Taiwan, and both of the population and density are the highest, the increasing rate of population is the lowest. On the other hand, in Taichung metropolitan area, not only the increasing rate of population, but also the members of household are the most of three metropolitan areas. And in Kaohsiung metropolitan area, although the population is the same as Taichung, the density is the lowest in three major metropolitan areas. Fig.1 shows the location and traffic system of three major metropolitan areas. All of them are formed by city and prefecture. Taipei is the only city that has the rapid transit from 1997. The traffic systems of three metropolitan areas are saw as concentric circle, and the center are the center station respectively.

### 2-2.Outline of the private condominium in three major metropolitan areas

We defined some keywords in this paper as follow.(1) The housing form was divided into 3 types

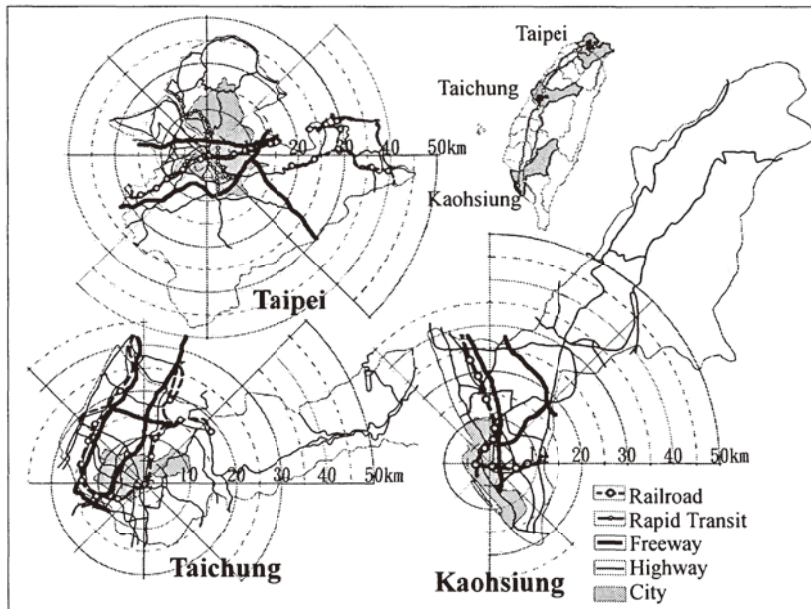


Fig.1. Location and Traffic System of 3 Major Metropolitan areas

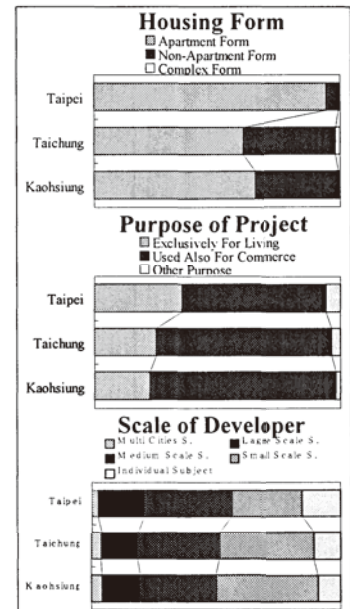


Fig.2.Composition on the Indexes of the Private Condominium

as (a)"apartment form : which contain apartment house and apartment store", (b)"non-apartment form : which contain row house and row store"<sup>1)</sup>, (c)"complex form : which contain apartment form and non-apartment form". (2) The scale of developer was divided into 5 types as (a)"multi-cities subject : which had developed the projects in more than two major metropolitan areas". (b)" large-scale subject : which had developed the projects in only one metropolitan area and the total dwelling numbers are more than 200 during these ten years, (c)" medium-scale subject : -----and the total dwelling numbers are 50~99", (d)"small-scale subject : -----and the total dwelling numbers are less than 50", (e)"individual : which had developed the projects by individual subject ". (3) The purpose of project was divided into 3 types as (a) "exclusively for living : the project which just for living", (b)"used also for commerce : the project which also contains store", "other purpose : the projects which contain the non-residence as office, shopping center, etc."

Table 2 shows the outline of the projects in the three metropolitan areas during the ten years. The total numbers of the developers are 5657 in 3 metropolitan areas, the total numbers of the project are 11086 , and the total numbers of dwellings are 938749. The numbers of project per developer is 1.96, and the numbers of dwelling per project is 85. From the result above we knew that the characteristic of project in the three metropolitan areas is discontinuously by extremely many developers. And all the indexes such as the numbers of developer's scale, the numbers of project, the density of dwelling, the dwelling numbers per project show the same order as Taipei> Taichung> Kaohsiung.

Fig 2 shows the composition of private condominium. See the housing form, the rate of apartment form is about 90 percent in Taipei, and both of Taichung and Kaohsiung are above 60%. Then see the purpose of project, the purpose of "used also for commerce" is the most, especially in Kaohsiung. See the scale of developer, the main subject is medium or small-scale subject. Fig.3 shows the composition and numbers by distance. The total dwelling numbers beyond 20 km radius of Taipei and 15km radius of kaohsiung respectively is just about 3%<sup>2)</sup>. In Taipei, the primary supply radius is 5~9.9km radius, compare with Taichung and Kaohsiung, they are within 5 km radius. On the other hand, about the dwelling numbers per project, it increases from the downtown to suburbs in Taipei, but decrease in Taichung and Kaohsiung.

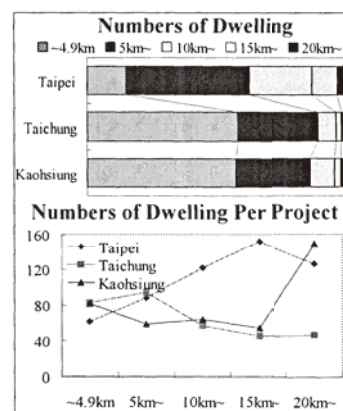
Fig 4 shows the composition of housing form by distance. The common trend is that there are many apartments in the downtown but decrease from the downtown to suburbs. The rate of apartment is high in all of Taipei metropolitan area, but the rate of apartment decrease beyond 10 km radius of Taichung and Kaohsiung. Fig.5 shows the composition of project's purpose by distance. In Kaohsiung, the purpose of "used also for commerce" decrease from the downtown to suburbs, but in Taipei and Taichung, they decrease within 10km radius and increase again beyond 15km radius. Fig.6 shows the composition of developer's scale by distance. In Taipei,

**Table 1. Population of 3 Major Metropolitan Areas (2000)**

	Area	Population	Increasing Rate of Population	Member of Household	Density of Population
	km <sup>2</sup>	million	'90-'00	person/home	person/ km <sup>2</sup>
Taipei	2325	6.21	7.74%	3.07	2673
Taichung	2214	2.46	21.79%	3.49	1111
Kaohsiung	2947	2.73	8.75%	3.11	925
Taiwan	36006	22.17	9.27%	3.41	614

**Table 2. Private Condominium in 3 Major Metropolitan Area (1991~2000)**

	Numbers of Developer companies	Numbers of Project cases	Numbers of Dwelling homes	Density of Dwelling homes/ha	Dwelling Per Project homes/cases
Taipei	2916	5445	505891	2.18	92.91
Taichung	1687	3128	253173	1.14	80.94
Kaohsiung	1054	2513	179685	0.61	71.50
Sum	5657	11086	938749	1.25	84.68



**Fig.3 .Numbers of Dwelling by Distance**

the large-scale subjects increase and the medium or small scale-subjects decrease from the downtown to suburbs, compare with Taichung and Kaohsiung, the large-scale subjects increase and the medium or small-scale subjects increase.

### 3. Conditions on area and price of housing unit

#### 3.1 Conditions on housing area by distance

See the average housing area of the private condominium in three metropolitan areas respectively, Taipei is 38.28 ping (126.54m<sup>2</sup>), Taichung is 47.02 ping (155.43m<sup>2</sup>), and Kaohsiung is 8.25 ping (159.50m<sup>2</sup>). Fig.7 shows the average and composition of housing area by distance. The housing area is the smallest in Taipei. Compare with Taichung and Kaohsiung, they increase within 15 km radius, but decrease beyond 20km radius. See the compositions of the housing area, the numbers of the small scale housing increase beyond 20km radius in Taipei, but they increase beyond 15km radius in Taichung and Kaohsiung. Fig.8 shows the housing area of each housing form by distance. On the whole, the housing area of the non-apartment form is larger than the apartment form, especially in Taipei. The apartment store is similar with the non-apartment form (row house or row store) in Taichung and Kaohsiung. Then we analyze it by distance, the housing area decrease from the downtown to suburbs. From this graph we knew that the reason of this general trend (the housing area increase from the downtown to suburbs) is due to the difference of composition on housing form by distance. Fig.9 shows the housing area of each developer's scale by distance. The small-scale subject has the larger housing area than the large-scale subject, and the multi-cities subject in Taipei and the individual subject in Kaohsiung are similar. Then we analyze it by distance, but there are not the common trends by the developer's scale.

#### 3-2. Conditions on housing unit price by distance

See the average housing unit prices of the private condominium in three metropolitan areas respectively, Taipei is 25.78 ten thousand yuan/ping, Taichung is 14.54 ten thousand yuan/ping, and Kaohsiung is 14.73 ten thousand yuan/ping. Fig.10 shows the average housing unit price by distance. The average housing unit price is most expensive in Taipei. Then we analyze it by distance, on the whole, the housing unit price decrease from the downtown to suburbs, consequently the housing unit price in the downtown of Taipei is twice expensive than

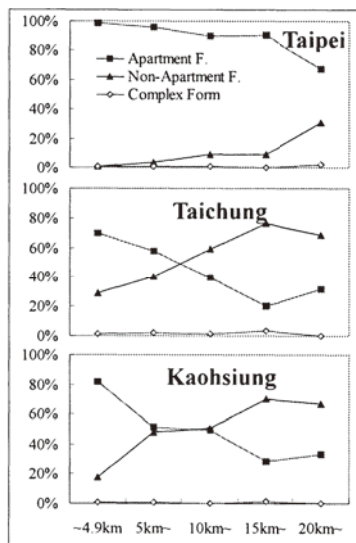


Fig.4. Composition of Housing Form by Distance

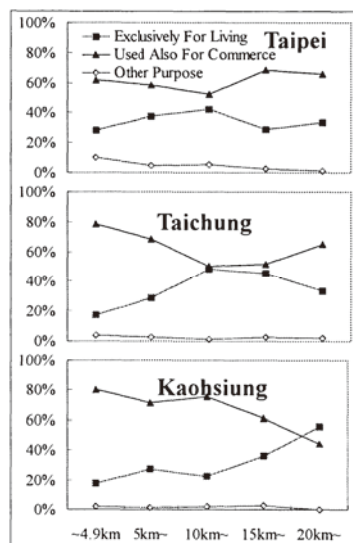


Fig.5. Composition of Project's Purpose by Distance

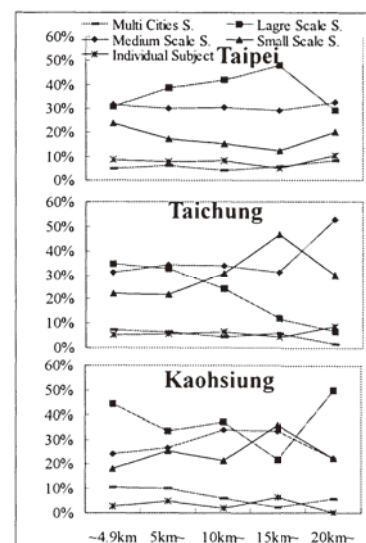


Fig.6. Composition of Developer's Scale by Distance Radius

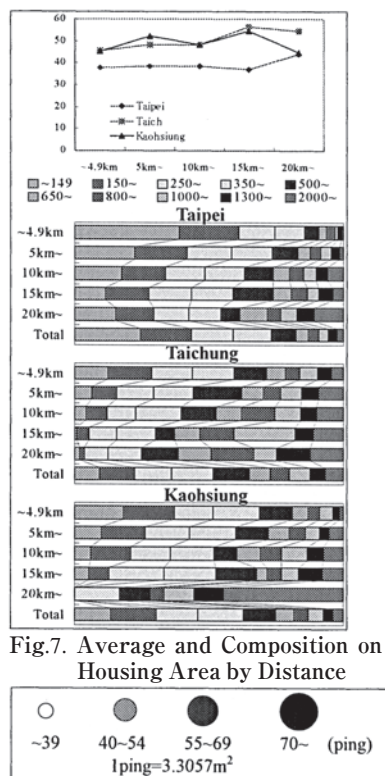


Fig.7. Average and Composition on Housing Area by Distance

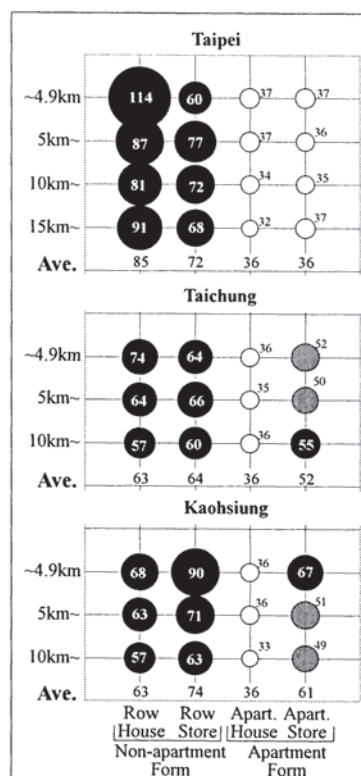


Fig.8. Housing Area of Each Housing Form by Distance

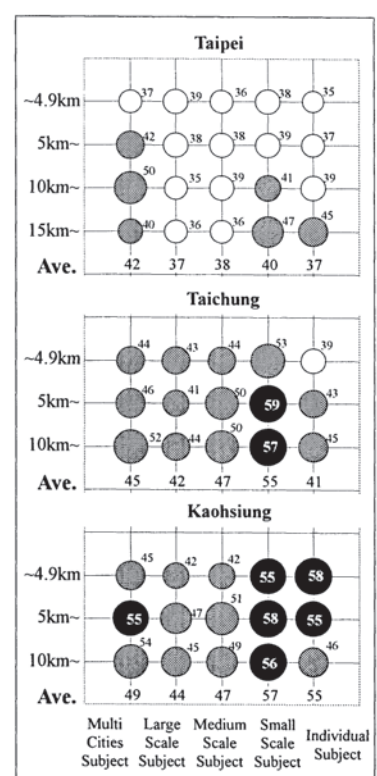


Fig.9. Housing Area of Each Developer's Scale by Distance

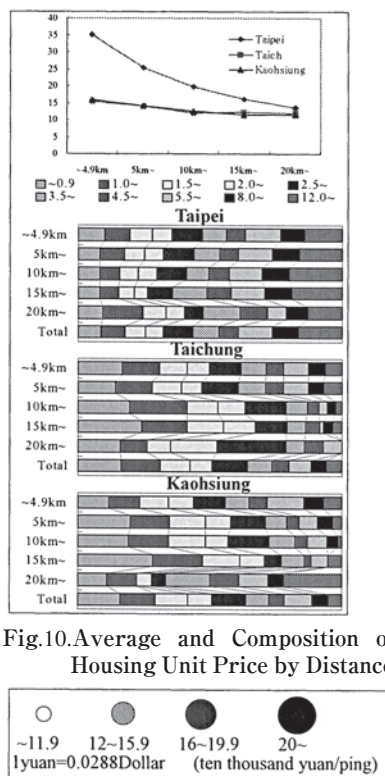


Fig.10. Average and Composition on Housing Unit Price by Distance

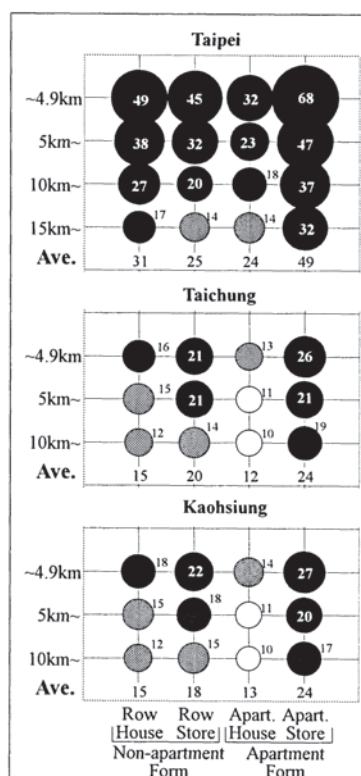


Fig.11. Housing Unit Price of Each Housing's Form by Distance

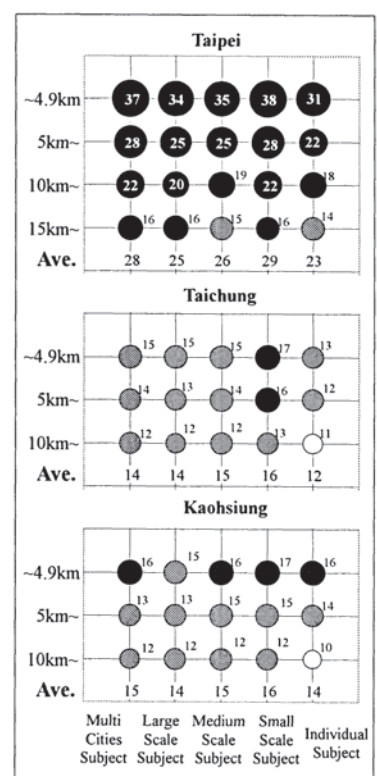


Fig.12. Housing Unit Price of Each Developer's Scale by Distance

Taichung and Kaohsiung, and they are similar beyond 20km radius in all of the three metropolitan areas. Fig11 shows the housing unit price of each housing form by distance. On the whole, the housing unit price of the apartment store is the most expensive. Then we analyze it by distance, all of the housing forms show that the housing unit price decrease from the downtown to suburbs. However in Taipei, the housing unit price decrease beyond 20km radius, in contrast, they change a lot within 10km radius of Taichung and 5km radius of Kaohsiung respectively. Fig12 shows the housing unit price of each developer's scale by distance. The small-scale subject has the higher price than the large-scale subject. Then we analyze it by distance, on the whole, the housing unit price decrease from the downtown to suburbs by every subjects.

### 3.3. Correlation between housing area and housing unit price by distance

Fig.13 shows the correlations between the average housing area and the housing unit price by the distance. The trends of the three metropolitan areas are different from each other. For example in Taipei, the housing price decrease from 13 million yuan in the downtown to 6 million yuan in suburbs. Then in Taichung, due to the housing unit price decrease and the housing unit price also decrease from the downtown to suburbs, so the housing price keeps at 7 million yuan. And in Kaohsiung, although the movement is the same with Taichung that within 10km radius, then the housing area and the housing price decrease from the downtown to suburbs. Fig.14 shows the correlations between the housing area and the housing unit price of each housing form by distance. Compare the apartment house and the apartment store. In Taipei, the housing unit price and housing price are different with each other. Although the housing area is similar with each other in each of the radius, the housing unit price and housing price decrease from the downtown to suburbs. Next, compare the row house with the row store, although the change of each housing area is different, the housing unit price and housing price decrease from the downtown to suburbs all of the housing forms.

## 4. Conditions on area and price of project unit

### 4-1. Conditions on site area by distance

See the average site area of the private condominium. Taipei is 483 ping (1597m<sup>2</sup>), Taichung is 756 ping (2499m<sup>2</sup>), and Kaohsiung is 588 ping (1944m<sup>2</sup>). Fig.15 shows the average site area by distance. The order of site area within 20 km radius is Taichung > Kaohsiung > Taipei.

Fig.16 shows the site area of each housing form by distance. The order of site area is "complex form" > "non-apartment form" > "apartment form" in Taipei and Taichung, but it is "non-apartment form" > "apartment form"

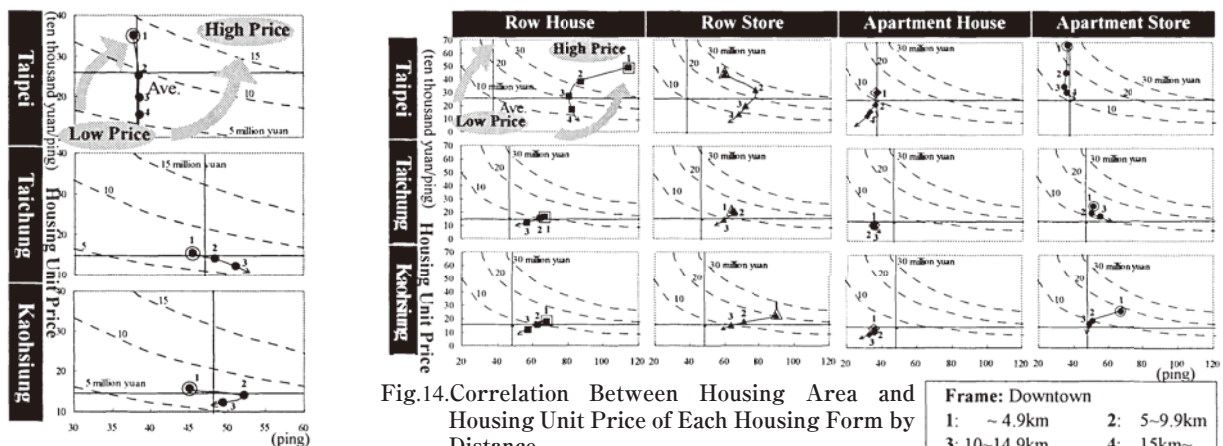


Fig.13. Correlation Between Housing Area and Housing Unit Price by Distance Radius

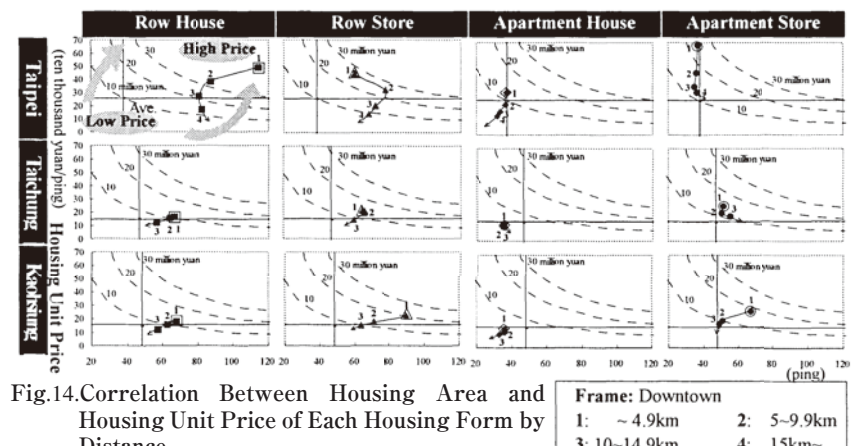


Fig.14. Correlation Between Housing Area and Housing Unit Price of Each Housing Form by Distance

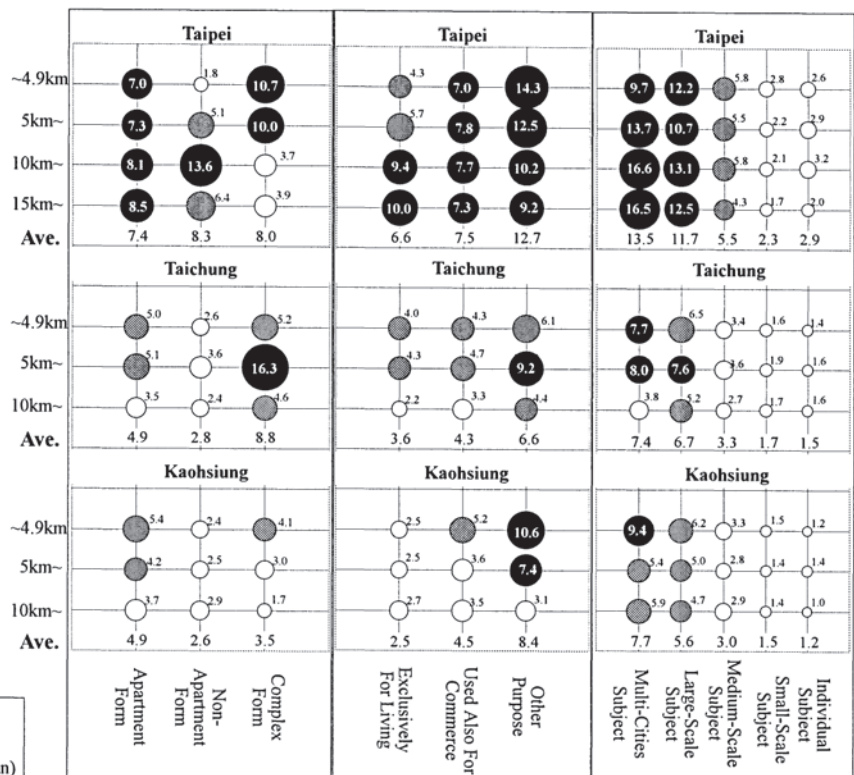
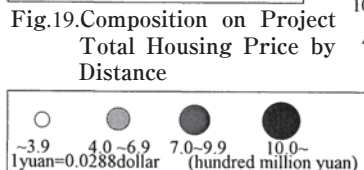
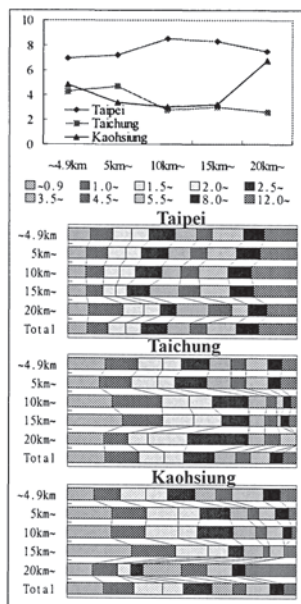
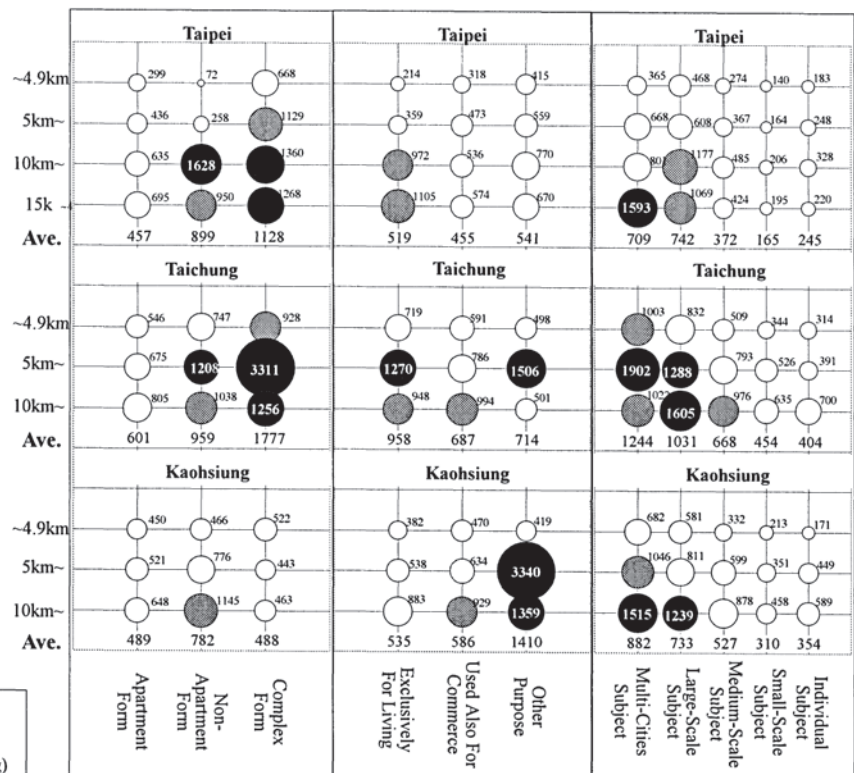
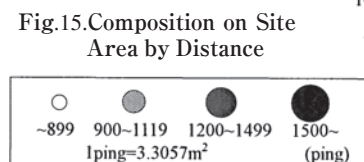
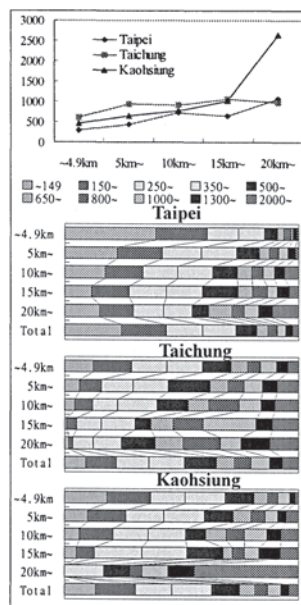


Fig.20. Project Houses Total Price of Each Housing Form by Distance

Fig.21. Project Houses Total Price of Each Project Use by Distance

Fig.22. Project Houses Total Price of Each Developer Scale by Distance

≡ "complex form" in Kaohsiung. Then we analyze it by the distance, the site area of the apartment form of three metropolitan areas and the non-apartment form of Kaohsiung increase from the downtown to suburbs.

Fig.17 shows the site area of each project's purpose by distance. In Taipei, the size order is "other purpose" > "exclusively for living" > "used also for commerce", and in Taichung, the size order is "exclusively for living" > "other purpose" > "used also for commerce", and in Kaohsiung, the size order is "other purpose" > "used also for commerce" > "exclusively for living". Then we analyze it by distance, on the whole, the site areas increase from the downtown to suburbs.

Fig.18 shows the site area of each developer's scale by distance. The size order is "multi-cities" > "large-scale" > "medium-scale" > "small-scale" > "individual subject". Then we analyze it by distance, on the whole, the site area increases from the downtown to suburbs.

#### 4.2. Conditions on total housing price of project

See the average total housing price of the private condominium in three metropolitan areas respectively, Taipei is 7.49hundred million yuan, Taichung is 4.18hundred million yuan, and Kaohsiung is 4.09hundred million yuan. Fig.19 shows the total housing price of project. In Taipei, the total price increase from the downtown to suburbs, but decreases a little beyond 15km radius. In Taichung, the most expensive project is within 5~9.9 km radius, then decrease to suburbs. And in Kaohsiung, it is the most expensive in the downtown, and decrease to suburbs.

Fig.20 shows the total housing price of each housing form by distance. The trend of each metropolitan area is different, and it depends on the different composition of housing form. The order is "non-apartment form" > "complex form" > "apartment form" in Taipei, "complex form" > "apartment form" > "non-apartment form" in Taichung, and "apartment form" > "complex form" > "non-apartment form" in Kaohsiung. On the other hand, we analyzed them by distance, but the orders are different with each metropolitan area.

Fig.21 shows project total housing price of each project's purpose by distance. On the whole, the order is "other purpose" > "used also for commerce" > "exclusively for living" in the three metropolitan areas. Then we analyze it by distance, the most expensive projects are in the midtown of Taichung, and in the downtown of Kaohsiung, but the trend is not found in Taipei. (The most expensive is "exclusively for living" in suburbs and "other purpose" in the downtown of Taipei.)

Fig.22 shows the total housing price of each developer's scale by distance. On the whole, the order is "

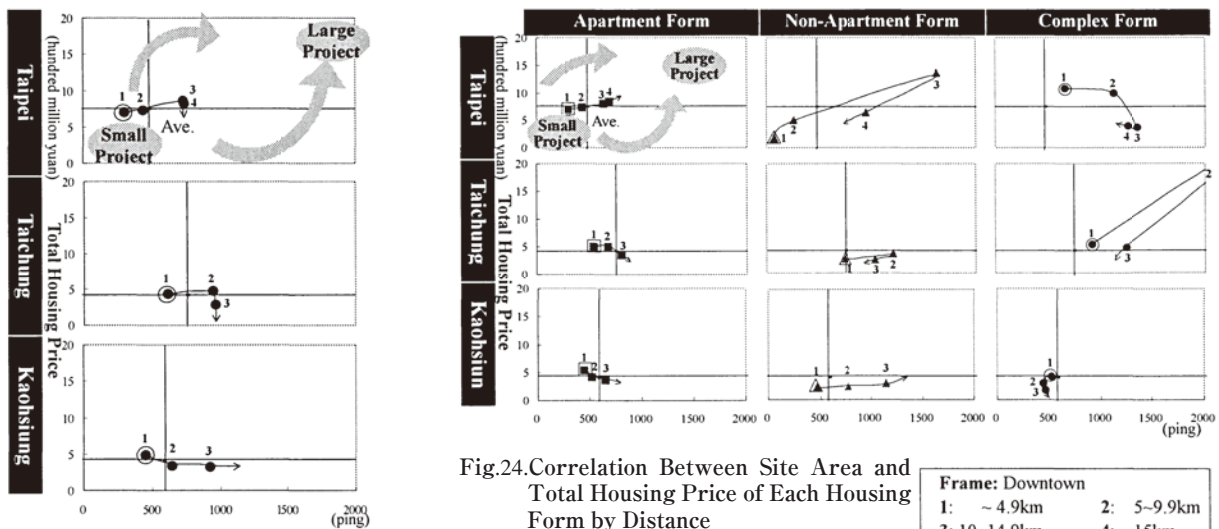


Fig.24. Correlation Between Site Area and Total Housing Price of Each Housing Form by Distance

Fig. 23. Correlation Between Site Area and Total Housing Price by Distance

multi-cities" > "large-scale" > "medium-scale" > "small-scale" > "individual subject". Then, we analyze it by distance. In Taichung and Kaohsiung, the common trend of all developer's scales is the same as the average trend above, expect the most expensive projects are in the midtown of Taichung and in the downtown of Kaohsiung. Compare with Taipei, the price increase by the multi-cities or the large-scale subject in suburbs, and by the small-scale or individual subject in the downtown.

#### 4.3. Correlation between site area and project's total housing price by distance

Fig.23 shows the average of the site area and total housing price by the distance. On the whole, the site area increases from the downtown to suburbs. The total housing price increases in Taipei, but decrease in Kaohsiung. On the other hand, the increase of site area stops and the housing total price decreases beyond 10km radius of Taichung and beyond 15km radius of Taipei.

Fig.24 shows the average site area and project's total housing price on housing form by distance. Although the apartment form just has a little change by distance in all of the three metropolitan areas, the change of non-apartment is remarkable (especially in Taipei). And both of the apartment and the non-apartment have the same movement. But in Kaohsiung, the total housing price of non-apartment increases from the downtown to suburbs. (It is different from the whole trend).

### 5. Conclusions

We have studied about the area and price of the private condominium in three major metropolitan areas from the viewpoint of location. At first we found the location characters on the numbers of project, the composition of developer's scale, the composition of housing form, and the composition of project's purpose. Next, we also found the characteristics on the housing unit price, the housing price, the site area, and the total housing price are different by the distance.

To sum up the major characteristics as that if we compare the same housing form, it has "higher standard" as large housing area and expensive housing price in the downtown, but because there are more apartment houses in downtown, the average residence level becomes "low standard" in the downtown. And we also know that there is the least scale of projects in the downtown. However, the other characters are not the same in three metropolitan areas because of the different scale or character of each metropolitan area. We summarized the characteristic of each metropolitan area respectively as follows.

(1) Taipei metropolitan area : As the capital of Taiwan, both of the population and the density of population are the highest, but the marked hollowness is being started in the downtown. The rate of apartment and the purpose of "used also for commerce" are extremely high, and the rate of large-scale subject increases from the downtown to suburbs. The housing area almost has no change by distance, and due to the housing unit price increase from the downtown to suburbs, so the housing price increase. On the other hand, the project by the non-apartment form and the large or medium-scale subject trend to "low standard" from the downtown to suburbs. About the project unit, both of the site area and the housing price increase from the downtown to suburbs, especially in the non-apartment form and the multi-cities or large-scale subject.

(2) Taichung metropolitan area : The increasing rate of population is the highest, but the housing supply is just within 15km radius. The apartment form, the purpose of "exclusively for living" and the large-scale subject decrease from the downtown to suburbs. The housing price maintains from the downtown to suburbs, because the increased housing area and the decreased housing unit price.

(3) Kaohsiung metropolitan area : As the second city of Taiwan, the population is next to Taipei metropolitan area, but the density of population is third of three metropolitan areas. The compositions of the housing form, the developer's scale, and the project's purpose are similar as Taichung. The housing area increase and the hous-

ing price are stable within 10km radius, but change to decreasing on the housing area, the housing unit price and the housing price beyond 10km radius. And the trend above is common to all of the developer's scale, but they become "low standard" as above on all of the housing form, and they due to the apartment decrease from the downtown to suburbs. And the site area increase and the total housing price decrease a little from downtown to suburbs.

#### Notes

- 1) According to this paper, there are few detached house and semi-detached house in the private condominiums of Taiwan, so we combined them to row house.
- 2) Because there are few numbers beyond 15km radius in Taipei and 10km radius in Taichung and Kaohsiung, we combined them respectively in the analyses of Chapter 3 and chapter 4.

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