

The Influence of Policy for School District Housing

-- Taking Bashu Middle School in Chongqing Jiangbei as An Example

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Abstract: High rate of housing price of school district house has led to serious social phenomena such as buying a house for school, which increase the financial burden of some families. Thus, in order to relief those phenomena, government impose some policies. This paper used Hedonic Price Model to test what factor will affect housing price change and use dummy variable to test whether the policy is efficiency. The results show a 12.8% decrease in the rate of change from school district houses to regular houses.

Keywords: Hedonic Price Model, Dummy variable, Multiple regression.

1. Introduction

In southwest China, the premium rate of house is nearly 40% in Chongqing. According to the bureau, the month-on-month increase in new home prices in Chongqing topped the country for two consecutive months in April and May 2021. The price of school district housing sustains increase due to some sensationalization by land agent, and the basic reason of this situation is uneven distribution of education resources. Thus, price of school district housing is a problem in China. In recently year, the government has introduced some policies to equalize the distribution of educational resources.

1.1. The Ppolicy of Jiangbei Government

Transfer private school to public ownership:

In accordance with the relevant provisions of the State and the Ministry of Education, the district Committee and the district government, after studying and deciding to standardize and improve the enrollment method of the public compulsory education schools, the District Education Committee shall specify the enrollment method in light of the actual situation, and shall not use the private school system to recruit students and charge fees. Those school are called private-to-public school.

Bashu Middle school is private-to-public school, and it was classified in Jiangbei District. Thus, the enrollment standard of this school is based on the enrollment policy of Jiangbei District.

Enrollment policy be announced on 3rd of December [1]:

1. Jiangbei District's private-to-public school in line with the agreement (legal) can be directly enrolled

2. On the premise that the degree is available, parents or legal guardians of school-age children who meet the requirements of applying for the private-to-public school lottery in Jiangbei District will be randomly assigned seats by computer. To participate in the lottery, meet one of the following criteria: (1) Have registered residence in Jiangbei District; (2) his/her father (or mother) or legal guardian has a property right certificate and actually lives in Jiangbei District; (3) Those who meet the admission requirements of the children of the floating population living outside the district of Jiangbei shall also meet the following conditions: ① The

student and his/her parents or legal guardian are registered outside jiangbei District. ② The parent or legal guardian of the student is a legal employee or worker in Jiangbei District. ③ The student moves with his/her father, mother or legal guardian to Jiangbei District and actually lives there temporarily.

1.2. Actual Situation

Luneng Bashu is a very influential school in Chongqing with strong faculty. It achieved excellent results in the high school and high school entrance examinations in July 2021. In the college entrance examination, 4 students were admitted by Tsinghua University, with 26% students scoring more than 600 points; 77.9% students went to the special control line; There are 95.9% undergraduates. In the high school entrance examination, nearly 100 people with more than 710 points, nearly 300 people with more than 700 special scores, and nearly 90% of the combined recruitment online rate (Luneng Bashu Milled school, 2021)[1], so students from all districts of Chongqing want to apply for this school.

The school district housing of Luneng Bashu Middle school is LuNeng XinCheng 1~13 communities before 3rd of December in 2021. Thus, there are legal contract for buyers of those 13 communities. And for this school, the total number of enrollments are 750. Depend on the enrollments policy, school-age students in those communities with the legal agreement will take up a portion of the entrances, so the remaining entrances for other students satisfy the admission requirement are not enough. Thus, the school based on the provisions of the Bureau of Education rest of the students for admission lottery. Registered residence in Jiangbei District is essential requirement for eligibility for the lottery. This requirement results students in other district without any admission opportunities, so if they want to get eligibility for the lottery, they would have proof of home ownership and actual residence.

After December in 2021, only 8 and 10 communities of LuNeng XinCheng belong to Jiangbei District. So the home ownership of 8 and 10 communities are useful for eligibility for the lottery, while other communities of LuNeng XinCheng are less attract for students from other districts.

1.3. The Problem Resaerched

1. Determine the degree of influence by different communities in different districts.
2. Find relationship between change of price form December in 2021 to now and each characteristic.

2. Literature Review

In the article Study on school district housing premium based on boundary fixed effect method [2], based on the Hedonic price model to accurately measure the "capitalized" spillover effect of high-quality basic education resources on real estate by pairing houses in adjacent provincial key school districts. It is concluded that the housing of school districts within the scope of provincial key primary schools is 8.3% higher than that of non-provincial key primary schools.

Based on Huang Binru, her article "The influence of supporting education on the housing price around it" [3] combined with the impact of the zoning policy of the primary schools affiliated to Renmin University of China using the housing prices around them through a Hedonic model analysis. It finally concludes that "zoning" has a significant positive impact on the prices of second-hand housing around the primary schools affiliated to Renmin University of China.

In the article Study on the Impact of Quality Education Resources on School District Housing Prices in Hangzhou [4], using residential market data, the impact of having quality educational resources on the price of school district houses was studied. The results show that the premium for school district houses near key secondary schools in Hangzhou is 25.5% and the premium for those with key primary schools is 12.8%.

After those articles, in decided to use thorough and wide using model, which is hedonic price model.

In the article Mechanisms influencing the price of school district housing in Shanghai [5], using Hedonic price models and multiple regression analysis shows The school factor had the second highest impact on house prices at 20.63%. Residential prices will fall by an average of 8.698% for each additional level of school priority; 0.896% for each additional level of primary school ranking in the neighborhood; 0.995% for each additional 100 metres of distance from a key secondary school; and 0.995% for each additional 100 metres, residential prices will fall by an average of 0.499%.

Base on He Ling's study [6]. He researches influence of rent of house in Chongqing. It determines 18 characteristics of house in 2014 and finally use log-linear model to show the relationship between each characteristic and rent of its house. This paper shows the general step to find HPM: Step1: determine characteristics. Step2: collect data of each characteristic. Step3: determine suitable model. Step4: analyze data

3. Methodology

3.1. Hedonic Price Model

According to the definition of hedonic price model (He L, 2017) [6], commodity price is composed of characteristic prices of multiple attributes, and the size of the implied price of an attribute is related to the degree of influence of the attribute on commodity price. Therefore, the essence of the characteristic price model is to build the functional relationship between commodity price and each attribute, and judge the influence degree of the attribute and the implied

price through the coefficient value of each attribute.

$$p = f(x) + \varepsilon = f(x_1, x_2, \dots, x_k) + \varepsilon$$

Where, p represents commodity price, x_i represents commodity characteristics, and ε represents random disturbance term.

3.1.1. The Functional Form of Hedonic Model

The general functional form of the characteristic price model is: where represents the characteristic attributes of the commodity. $p = f(Z_1, Z_2, \dots, Z_n)Z_i$ In practical application, effective variables and appropriate function forms are firstly selected, and then sample data is collected. Finally, characteristic price model is constructed from statistical perspective. Its form generally has 4 kinds, the form is as follows formula (He L, 2017) [6].

Formula 1: Linear form

$$p = \alpha_0 + \beta_1 Z_1 + \beta_2 Z_2 + \dots + \beta_n Z_n + \varepsilon$$

Where, Z_1, Z_2, \dots, Z_n respectively represent the different attributes of the commodity, $\beta_1, \beta_2, \dots, \beta_n$ respectively represent the implied price corresponding to each attribute of the commodity, α_0 are constant terms, and represent the sum of the influencing factors excluding the influencing factors of the characteristic attributes of the commodity. ε Represents error correction items.

Formula 2: logarithmic form

$$\ln p = \ln \alpha + \beta_1 \ln Z_1 + \beta_2 \ln Z_2 + \dots + \beta_n \ln Z_n + \varepsilon$$

Where Z_1, Z_2, \dots, Z_n respectively represent different attributes of the commodity. At this time, $\beta_1, \beta_2, \dots, \beta_n$ it is no longer the increment of value Z_i brought by an additional unit of an attribute, but the elasticity of commodity price to its characteristic attributes. The disadvantage is that the values of p and Z cannot be 0.

Formula 3: semi-log form

$$p = \ln \alpha + \beta_1 Z_1 + \beta_2 \ln Z_2 + \dots + \beta_n \ln Z_n + \varepsilon$$

Where Z_1, Z_2, \dots, Z_n respectively represent the different attributes of the commodity and $\beta_1, \beta_2, \dots, \beta_n$ represent the elasticity of the commodity price to its characteristic attributes. Its shortcoming is that the Z value cannot be 0.

Formula 4: log-linear:

$$\ln p = \alpha_0 + \beta_1 Z_1 + \beta_2 Z_2 + \dots + \beta_n Z_n + \varepsilon$$

Where, Z_1, Z_2, \dots, Z_n respectively represent the different attributes of the commodity, in this case $\beta_1, \beta_2, \dots, \beta_n$ represents the elasticity of the commodity price to its characteristic attributes, and refers to the percentage change of the commodity price p when the absolute amount of an attribute Z_i changes by one unit when other variables remain unchanged.

The linear model is selected in this paper because the sum value Z and p can be 0 and reduce the fluctuation of characteristics to match the fluctuation level of other characteristics.

3.2. Dummy Variable

In statistics and econometrics, particularly in regression analysis, a dummy variable is one that takes only the value 0 or 1 to indicate the absence or presence of some categorical effect that may be expected to shift the outcome.

In this article, communities be separated into two parts. The one is community with eligibility for the lottery are value 1 but another one is be valued by 0 which is community without opportunities of lottery. Thus, the new basic function combine with dummy variable are below:

$$p = \alpha_0 + \delta_0 \text{lottery}_i + \beta_1 Z_1 + \beta_2 Z_2 + \dots + \beta_n Z_n + \varepsilon$$

The $\text{lottery}_i=1$ represent community whit eligibility for

the lottery, and the $lottery_i=0$ represent community without eligibility for the lottery. And $E(p/lottery = 1) = \delta_0 \times 1 + c$, $E(p/lottery = 0) = \delta_0 \times 0 + c$. So $E(p/lottery = 1) - E(p/lottery = 0) = \delta_0$.

3.3. Data Collection

Change rate of housing price between January and April in 2022 was represented change of price form December in 2021

to now and each characteristic. Based on research by He. L in 2014[6], there are 18 factors for house in Chongqing. However, those 13 communities are very close and share the same park and public transport stations, so finally 8 factors decided as characteristics. Then collecting 130 data about each characteristic in 13 communities. Before the collection, the data should be numbered and be quantified. The table below shows the way to quantify each characteristic.

Table 1. quantified characteristics

characteristic	WAY
Teaching area	original data
age of building	original data
hight of home	Variable assignment: Multi-level (1), small high-level (2), high-level (3)
Afforestation rate	original data
property	original data
fitment	Variable assignment: Rough room(1) Simply furnished(2) Moderately furnished(3) Finished(4) Luxuriously furnished(5)
orientation	Variable assignment: North(1) East/West(2) South(3)
admission	dummy variable: there is lottery eligibility (1), no(0)

3.4. Data Analysis

STATA software is used to test the residual normality of the rate of change in housing price to judge whether the data

conforms to the normal distribution, because the normal distribution is the theoretical hypothesis of multiple regression. Figure 1 below shows the Normal Quantile Chart of change rate.

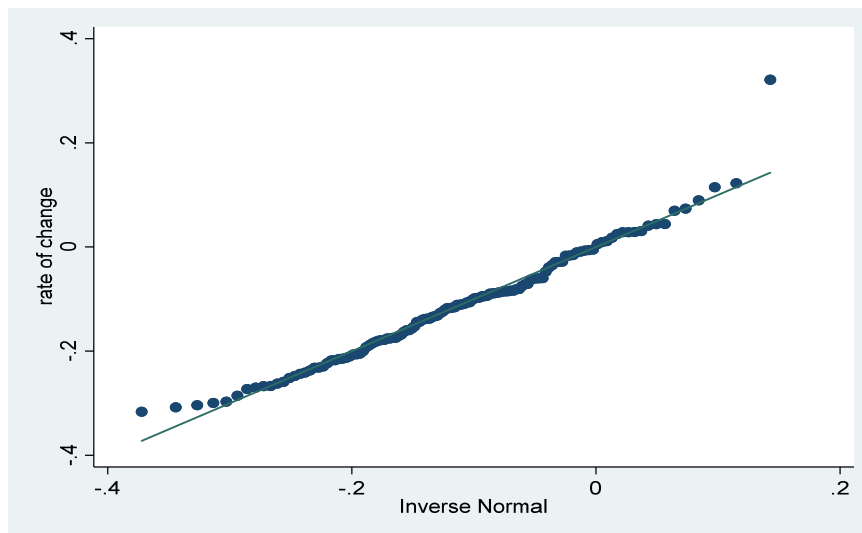


Figure 1. Normal Quantile Chart

Stata software was used for data analysis of 130 groups of samples, and the model summary, detection values and

regression coefficients were analyzed as follows

Table 2. Model Summary

The formula	R-square	Adj R-square	Root MSE	F
linear of rate of change prices	0.4714	0.4364	0.07968	13.49

Table 3. The Variance of linear

Source	SS	df	MS
Model	.684980838	8	.085622605
Residual	.768131347	121	.006348193
Total	1.45311218	129	.011264436

Table 4. Regression Analysis of Coefficient

Rate of change	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Teaching area	.0007244	.0003072	2.36	0.020	.0001163	.0013326
Age of building	.0008921	.0023475	0.38	0.705	-.0037555	.0055396
Height of home	-.0453678	.0095991	-4.73	0.000	-.0643718	-.0263638
Afforestation rate	-.652791	.1824526	-3.58	0.000	-1.014004	-.291578
property	.030285	.0223041	1.36	0.177	-.0138719	.0744419
fitment	-.0023349	.0087535	-0.27	0.790	-.0196649	.0149951
orientation	.0128443	.0096196	1.34	0.184	-.0062001	.0318888
l.admission	.1282509	.024421	5.25	0.000	.079903	.1765988
cons	.0364073	.0959048	0.38	0.705	-.1534615	.2262762

According to the above data, four characteristics pass the test, Teaching area, Height of home, Afforestation rate and admission. In conclusion, change of rate will rise 0.07244% as teaching area rise 1 m², and fall 4.53678% as height of home add 1 level, also fall 65.2791% as afforestation rate add 1%. Admission for lottery would affect change of rate, the house which with admission for lottery allow change of rate rise 12.82509%, while other house cannot. The final hedonic price model for change of rate is below:

Change of rate=3.64%+0.072% × Teaching area-4.54%×Height of home-65.3%× Afforestation rate+12.8%× admission 1

4. Conclusion

Based on dummy variance, the increase rate of housing price of house which has lottery admission is 12.8% more than house without lottery admission. Thus, this policy relives high rice of school district housing, but there still school district house like 8 and 10 communities which has lottery admission for very influence school. In essence balance the education resources is the most direct solution even though it is very difficult.

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