Chapter 39
Empirical Study on Relationship Between China's Real Estate Price Growth and Market Power-Based on Statistics from the Nation, 30 Provinces and 35 Cities

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Abstract In recent years, with the deepening of marketization, China's real estate price has been increasing constantly and attracts the general concern of the whole society. In order to restrict the excessive growth of the market prices, the government continues to strengthen macro-intervention. In market economy, the formation of real estate price depends on the real estate market conditions. The power comparison of supply and demand sides will have a direct impact on the real estate price changes. The real estate market power of the supply and the demand reflects their ability to influence the real estate price, reveals the market conditions as well as structure characteristics of real estate market, and has significant influence on the growths of real estate price. In this paper we adopt Lerner Index to measure the real estate market power. We choose the real estate market sales data of the nation, 30 provinces and 35 large and medium-sized cities as sample and estimate China's real estate market power and the average increase of real estate price. Based on that, we analyze the relationship between increase amplitude of real estate price and the market power. The result of the study shows that China's real estate price changes and the real estate market power present a positive correlation and real estate market power is one of the main factors influencing the changes of real estate price.

Keywords Real estate • Price changes • Market power

39.1 Introduction

In 1998 China cancelled the welfare-oriented public housing distribution system. With the implement of housing fund and the increasing of residents' income, China's real estate market represents a favorable trend and the price, as a problem focused on

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by the whole society, has been rocketing, especially from 2004. The rocketing housing price triggers a series of social and economic issues. The excessive growth of the house price becomes the important point of the macro-intervention. In market economy, the formation of real estate price depends on the market conditions. The macro-control of the real estate has to be based on the condition of the market. China's rocketing real estate price cannot be explained by the model of free market economy. The power comparison of supply and demand sides will have a direct impact on the real estate price changes. The market power reflects the ability of the supply and demand sides to affect the price and has significant influence on the growth of real estate price. With the increasing of demand rigidity, the sellers' pricing power is becoming stronger and the price is largely decided by the sellers (The following *market power* refers to the *sellers*' *market power*). We choose the real estate market sales data of the nation, 30 provinces and 35 large and medium-sized cities as sample and estimate China's market power and the average increase of real estate price. We analyze the relationship between the amplitude of real estate price change and the market power. The result shows that China's real estate price changes and the market power present a positive correlation and the market power is one of the main factors influencing the changes of real estate price.

39.2 Related Literature

The relevant research of the real estate price theory is adequately systematical and brings about lots of papers and treatise which has already been widely applied in daily practice. The research of price mechanism in foreign real estate market usually pays more attention into the functioning of the price mechanism and the factors which influence the real estate prices. Denise and William [1] used a model which is similar with "cobweb model" to analyze the fluctuation of real estate market. Meanwhile, they proposed a classification which divides the real estate market into capital market and consumption market and described the four quadrant models of the interaction between capital and consumption markets based on these two conceptions; Rosen [2] and Guilloches (1977) gave a systematic summarization of the theoretical frame of Hedonic pricing and proposed house price model which was widely used in the research of house price and living environment. Di Pasquale and Wheaton [3] studied the relationship between house rent and house price and generated the well-known stock-flow model. This model describes how property market and capital market achieve equilibrium by modulating various variables such as rent, price, number of new constructions and house stock. Gabriel et al. [4] established a house price model which contained both market demand and supply factors they figured that the population migration and the evolution of city structure could explain the fluctuation of house price in California in the past 20 years.

The domestic real estate markets have a short history. Because of the more and more intense house price conflict, the analysis of the factors influencing the house price becomes quite abundant. In the aspect of house supply, lots of scholar pay

attention into the real estate cost. Zhang Hong and Li Wen dan [5], and Wang Xiazhong [6] believed that cost increase is the main factor of the rise of house price. Hu Ruixian [7] pointed out that the factor which determines the real estate price is nothing except cost and supply push. The demand control policy is hard to be an effective regulation measure. The government should focus on the cost control. Other scholars analyse the factors which influence the house price at the angle of real estate market demand. Wu Jianfeng [8] considered that the demand for better living conditions is the main factor of house price rising, along with the gradual increase of per capita wage; Zhang Daliang and Zhou Limei [9] made a research about how custom demand influences the house price; Qi Zhaozhen [10] had a analysis of the relationship between rent and house price; Zhang Hong and Li Wendan [5] analyzed how GDP influences the house price form economic gross angle.

Domestic scholars' researches of the market mechanism of the real estate are limited within some qualitative description. Some of the scholars realize that there must be some kind of interaction among land market, stock market and incremental market. Lou Jiang [11] described the theory of the city real estate market and makes a monographic study on the correlation between house price and land price; Gao Meicheng [12] realized that the stock market plays the main role of regulating the incremental market and claimed the opening of the stock market in order to promote the development of the entire real estate market. Zhou Huili [13] discussed that the differentiation of real estate products can enforce the monopoly power of the sellers and enhance their abilities of monopoly pricing. She considered that inner features of the real estate and market structures should be the starting point for restraining the excessively rapid rising-up of the house price. Kuang Weida [14] estimated Lerner index of Beijing and Tianjin. The results showed that the main market power of real estate was quite high in China's main cities and he concluded that the root cause of high house price is monopoly. Li Hongjin [15] calculated the panal data sectional data, historical data and Lerner index of different provinces. He claimed that the market competition of real estate was quite insufficient. The level of market monopoly was really critical and monopoly power could, to some degree, explain the house price rigidity in recent years. Wu Liping and Ju Fang [16] made an empirical analysis of the monopoly degree of real estate market and its effect in the excessively rapid rising-up of house price on the angle of market structure and market power. In addition, some other scholars studied house price factors based on real estate market intervention. The most important factor is the effect of Tax and macro-control.

39.3 Theoretical Analysis of Market Power Influences on House Price

In the real estate market, the price is decided by both sides of the market. With the increasing of demand rigidity, the sellers' pricing power is becoming stronger and the price is largely decided by the sellers. Hull Fanta Hector Seaman Index, Lorenz

curve, and Lerner Index can be used to measure the level of market power. In this paper we adopt Lerner Index to measure the real estate market power. Lerner Index reflects the level of the monopoly through measuring the degree that the price (P) deviates from the margin cost (MC). The expression to calculate Lerner Index (L) is:

$$\mathrm{L} = \frac{\mathrm{P} - \mathrm{MC}}{\mathrm{P}} = -\frac{1}{\mathrm{E_d}} \tag{39.1}$$

Supposed $P = f(L)$, the rate of house price increase is:

$$g = \frac{\Delta p}{p} = \frac{f(L + \Delta L) - f(L)}{f(L)} \tag{39.2}$$

According to the definition of differential coefficient we can get the simplified formula:

$$g' = \frac{\frac{f(L+2\Delta L)-f(L+\Delta L)}{f(L+\Delta L)} - \frac{f(L+\Delta L)-f(L)}{f(L)}}{\Delta L} = \frac{f(L)f(L + 2\Delta L) - f^2(L + \Delta L)}{\Delta L f(L) f(L + \Delta L)} \tag{39.3}$$

We can get formula 39.4 from formula 39.1:

$$P = \frac{MC}{1 - L} \tag{39.4}$$

In formula 39.3, as the denominator must be positive number, we just need to take consideration with the numerator. We can get the numerator through the formula of price and the Lerner Index.

$$f(L)f(L + 2\Delta L) - f^2(L + \Delta L) = \frac{MC}{(1 - L)} \frac{MC}{(1 - L - 2\Delta L)} - \frac{MC^2}{(1 - L - \Delta L)^2} \tag{39.5}$$

We can get the simplified formula 39.6:

$$g' = \frac{MC^2 (\Delta L)^2}{(1 - L - \Delta L)^2 f(L) f(L + \Delta L) \Delta L} > 0 \tag{39.6}$$

Therefore we can conclude that the amplification of price positively correlates with market power. The stronger the market power is, the faster the price increases.

39.4 Estimation of Domestic Real Estate Market Power

39.4.1 Selection of Relevant Variables and Data

According to the above-mentioned deduction, we can estimate the Lerner Index by the demand elasticity(E_d), which concerns with two statistics of the model: $\log y_{it} = a + b \log x_{it} + u$, the demand amount Y and the price X.. In the model, we can proved that b is equal to $1/E_d$. In process of Positive versus Normative analysis, we use the sales of commercial housing and the mean price of the commercial housing to replace. In the research process of this paper, we collect the real estate market saleroom and the mean price data of the nation, 30 provinces and 35 large and medium-sized cities.

The data of sales of national commercial housing as follows in the Table 39.1:

We also collect the data of the sales of the nation, 30 provinces and 35 large and medium-sized cities. All the data comes from China's National Bureau of Statistics, CEInet and China's economic and information statistical data base. Since the amount of the data is too large, we do not list it in detail.

39.4.2 The Analysis of the Calculation Results f Market Power

39.4.2.1 The National Calculation Results in Different Time Interval

Because the land access can be exchanged in 1987 and housing distribution system reform begin in 1998, we separately calculate the market power from 1987 to 1998 and from 1999 to 2010 and make a comparison in this paper.

This paper uses Eviews software through the model based on Least Squares method to regression analysis and result is in the Table 39.2:

From the upper table, we can see that both coefficient determinations of the two durations are significant. Besides, the Regression coefficients are significant and the margin of Regression errors are small. So the results of the regression of the model are comparatively ideal.

39.4.2.2 The Calculation Results of the Data from 30 Provinces

According to the statistics of provinces of China's real estate sales from 2000 to 2010, this paper uses Eviews software processing data based on Least Squares method. The following table is about the Lerner Index obtained in some provinces' real estate market and is based on the regression (Table 39.3).

Table 39.1 The data of sales of national commercial housing from 1987 to 2010

Year	Mean price (yuan)	Saleroom (ten-thousand yuan)	Sales volume(ten-thousand m^2)
1987	408.00	2,697	1,100,967
1988	503.00	2,927	1,472,164
1989	573.00	2,855	1,637,542
1990	703.00	2,866	2,018,263
1991	802.00	3,025	2,378,597
1992	1,050.00	4,289	4,265,938
1993	1,280.00	6,688	8,637,141
1994	1,409.00	7,230	10,184,950
1995	1,710.00	7,906	12,577,269
1996	1,806.00	7,900	14,271,292
1997	1,997.00	9,010	17,994,763
1998	2,063.00	12,185	25,133,027
1999	2,052.53	14,557	29,878,700
2000	2,111.63	18,637	39,354,400
2001	2,169.71	22,412	48,627,500
2002	2,250.20	26,808	60,323,400
2003	2,359.47	33,718	79,556,600
2004	2,713.88	38,232	103,757,100
2005	3,167.67	55,486	175,761,300
2006	3,366.79	61,857	208,259,600
2007	3,863.89	77,355	298,891,200
2008	3,799.94	65,970	250,681,800
2009	4,681.04	94,755	443,551,700
2010	5,032.33	104,765	527,212,400

Table 39.2 The result of the national real estate market's Lerner Index

Duration	Coefficient of determination (R^2)	T Statistics	Regression error	Regression coefficient (b)	Lerner Index (L)
1987–1998	0.9748	19.686	0.1837	1.9163	0.5218
1999–2010	0.9729	18.954	0.1670	2.9837	0.3352

According to T-statistics we can see that regression coefficients are significant and the root mean squared error is small. Therefore the regression result of selected sample is quite ideal from this model and can be used to analyze the market power.

39.4.2.3 The Results of the Data from 35 Large and Medium-Sized Cities

According to 35 large and medium-sized cities' annual data of commercial housing selling, we can get the coefficient of elasticity from this model by OLS method and then we can get Lerner index of real estate markets in different cities. The table below shows the reciprocal of elasticity of demand by regression through this model-the Lerner index of real estate markets in different cities (Table 39.4).

Table 39.3 The result of 30 provinces' real estate market's Lerner Index

Province	Coefficient of determination R^2	T Statistics	Regression error	Regression coefficient (b)	Lerner Index (L)
Beijing	0.613	3.984	0.313	1.248	0.801
Tianjin	0.922	10.846	0.197	2.135	0.468
Hebei	0.958	15.189	0.207	3.146	0.318
Shanxi	0.965	16.569	0.182	3.016	0.332
Inner ongolia	0.950	13.801	0.238	3.279	0.305
Liaoning	0.990	32.123	0.106	3.410	0.293
Jilin	0.940	12.559	0.275	3.460	0.289
Heilongjiang	0.924	11.037	0.282	3.109	0.322
Shanghai	0.875	8.352	0.172	1.433	0.698
Jiangsu	0.992	35.239	0.071	2.503	0.400
Zhejiang	0.970	17.994	0.097	1.749	0.572
Anhui	0.976	20.063	0.135	2.706	0.370
Fujian	0.946	13.274	0.154	2.051	0.488
Jiangxi	0.930	11.537	0.232	2.671	0.374
Shandong	0.989	30.000	0.101	3.016	0.332
Henan	0.989	29.630	0.129	3.830	0.261
Hubei	0.963	16.243	0.156	2.538	0.394
Hunan	0.967	17.005	0.208	3.535	0.283
Guangdong	0.952	14.122	0.170	2.395	0.418
Guangxi	0.887	8.840	0.487	4.309	0.232
Hainan	0.669	4.501	0.362	1.628	0.614
Chongqing	0.949	13.649	0.213	2.906	0.344
Sichuan	0.903	9.629	0.255	2.458	0.407
Guizhou	0.862	7.903	0.351	2.775	0.360
Yunnan	0.917	10.478	0.464	4.862	0.206
Tibet	0.648	4.290	0.794	3.407	0.294
Shanxi	0.969	17.621	0.149	2.630	0.380
Gansu	0.915	10.381	0.316	3.285	0.304
Qinghai	0.916	10.472	0.298	3.119	0.321
Ningxia	0.929	11.420	0.332	3.795	0.264
Xinjiang	0.852	7.598	0.467	3.551	0.282

Table 39.4 The result of 35 cities' real estate market's Lerner Index

City	coefficient of determination R^2	T Statistics	Regression error	Regression coefficient (b)	Lerner Index (L)
Beijing	0.773	4.881	0.176	0.860	1.183
Tianjin	0.948	11.260	0.155	1.748	0.572
Shijiazhuang	0.885	7.338	0.338	2.480	0.403
Taiyuan	0.884	7.300	0.264	1.926	0.519
Hohhot	0.981	19.121	0.115	2.207	0.453
Shenyang	0.706	4.100	0.733	3.005	0.333
Dalian	0.982	19.292	0.105	2.034	0.491
Changchun	0.919	8.884	0.310	2.756	0.363

(continued)

Table 39.4 (continued)

City	coefficient of determination R^2	T Statistics	Regression error	Regression coefficient (b)	Lerner Index (L)
Harbin	0.877	7.049	0.253	1.780	0.562
Shanghai	0.787	5.079	0.214	1.085	0.922
Nanjing	0.829	5.834	0.291	1.699	0.588
Hangzhou	0.937	10.176	0.159	1.621	0.617
Ningbo	0.923	9.188	0.131	1.201	0.833
Hefei	0.881	7.183	0.335	2.410	0.415
Fuzhou	0.850	6.304	0.215	1.356	0.737
Xiamen	0.964	13.740	0.111	1.531	0.653
Nanchang	0.947	11.171	0.253	2.824	0.354
Jinan	0.876	7.020	0.247	1.733	0.577
Qingdao	0.921	9.008	0.251	2.262	0.442
Zhengzhou	0.794	5.198	0.514	2.724	0.367
Wuhan	0.870	6.878	0.286	1.958	0.511
Changsha	0.796	5.228	0.551	2.883	0.347
Guangzhou	0.968	14.573	0.108	1.568	0.638
Shenzhen	0.943	10.739	0.144	1.547	0.646
Nanning	0.753	4.621	0.564	2.608	0.383
Haikou	0.581	3.116	0.509	1.587	0.630
Chongqing	0.174	1.215	3.388	4.115	0.243
Chengdu	0.773	4.888	0.374	1.830	0.546
Guiyang	0.950	11.565	0.184	2.133	0.469
Kunming	0.815	5.552	0.610	3.389	0.295
Xian	0.866	6.730	0.556	3.742	0.267
Lanzhou	0.209	1.358	1.034	1.405	0.712
Xining	0.788	5.107	0.585	2.989	0.335
Yinchuan	0.823	5.710	0.562	3.209	0.312
Urumchi	0.743	4.504	0.358	1.613	0.620

According to the regression analysis of sample data, the results of Haikou, Chongqing and Lanzhou only have a fitting degree of 0.5. The regression results are not appropriate to be used as standards for judging real estate market power.

39.5 Correlation Between Market Power and Fluctuation of House Price

39.5.1 Analysis Based on the Domestic Market Data

In order to analyze the relationship between the variation of domestic real state's price and the market power, We chose the consumption data of 1999–2010. We calculated the range of every year's house price and the annual Lerner Index

Table 39.5 The analysis data of the domestic market's house price of 1999–2010

Year	Sales	The sold space	The average price	Price variation (g)	Lerner Index (L)
1999	29,878,700.00	14,557.00	2,052.53	0.028792	0.090786
2000	39,354,400.00	18,637.00	2,111.63	0.027505	0.11673
2001	48,627,500.00	22,412.00	2,169.71	0.037099	0.154243
2002	60,323,400.00	26,808.00	2,250.20	0.048559	0.152302
2003	79,556,600.00	33,718.00	2,359.47	0.150208	0.493793
2004	103,757,100.00	38,232.00	2,713.88	0.16721	0.240948
2005	175,761,300.00	55,486.00	3,167.67	0.062861	0.339971
2006	208,259,600.00	61,857.00	3,366.79	0.147648	0.339275
2007	298,891,200.00	77,355.00	3,863.89	−0.01655	0.102617
2008	250,681,800.00	65,970.00	3,799.94	0.231873	0.301375
2009	443,551,700.00	94,755.00	4,681.04	0.075047	0.397881
2010	527,212,400.00	104,765.00	5,032.33	–	–

according to different sales and different average price. The data is shown below Table 39.5:

According to the result of the sheet above, we make the inspection of the linear logarithmic of the range of variation of house price and the annual Lerner Index, the results are presented below:

$$\mathrm{Log(g)} = -1.25178 + 1.062260\mathrm{Log(L)}$$

$$\mathrm{t} = (-2.128489)(3.455575)\ \ \mathrm{r}^2 = 0.598816$$

In the linear regression of the price variation and the Lerner Index time sequences, deflective error coefficient measures the elasticity of the variation of price to the Lerner Index. According to the results above, deflective error coefficient 1.062260 shows that when the Lerner Index increases one percent, the range of price variation will rise 106.23 %. indicating that the annual Lerner Index of the whole domestic market has marked effects on the house price variation

39.5.2 The Analyses Based on the Data of 30 Provinces

In order to analyze the relationship between house price variation and the market power more deeply, authors chose the real estate sales data of 1999–2010 of 30 provinces. After calculating each province's increasing range of average price and Lerner Index of 1999–2010, we get the following data Table 39.6:

According to the results above, the authors made the inspection of the linear logarithmic of the range of variation of house price and the annual Lerner Index, the results are presented below:

$$\mathrm{Log(g)} = -1.708539 + 0.532438\mathrm{Log(L)}$$

$$\mathrm{t} = (-16.47822)(5.477311)\ \mathrm{r}^2 = 0.508482$$

Table 39.6 The analysis data of the 30 provinces' house price of 1999–2010

Province	The average increasing of the house price (g)	Lerner Index (L)	Province	he average increasing of the house price (g)	Lerner Index (L)
Beijing	0.12139627	0.801	Hubei	0.1054544	0.394
Tianjin	0.128897329	0.468	Hunan	0.1052938	0.283
Hebei	0.093886999	0.318	Guangdong	0.0852226	0.418
Shanxi	0.12165076	0.332	Guangxi	0.0843471	0.232
Inner Mongolia	0.11032863	0.305	Hainan	0.1623405	0.614
Liaoning	0.08145101	0.293	Chongqing	0.1121829	0.344
Jilin	0.0910491	0.289	Sichuan	0.1105766	0.407
Heilongjiang	0.08035466	0.322	Guizhou	0.0950131	0.36
Shanghai	0.1480259	0.698	Yunnan	0.0616362	0.206
Jiangsu	0.12780125	0.4	Xizang	0.1175084	0.294
Zhejiang	0.15801922	0.572	Shanxi	0.1267995	0.38
Anhui	0.12187646	0.37	Gansu	0.0916655	0.304
Fujian	0.1112796	0.488	Qinghai	0.0722934	0.321
Jiangxi	0.13959513	0.374	Ningxia	0.0859354	0.264
Shandong	0.1046993	0.332	Xinjiang	0.0787214	0.282
Henan	0.10662349	0.261	–	–	–

According to the results above, deflective error coefficient 0.532438 shows that when the Lerner Index increases 1 %, the range of price variation will rise 53.24 % indicating that the annual Lerner Index of the 30 provinces' market has marked effects on the house price variation.

39.5.3 The Analysis Based on the Data of 35 Cities

Regional characteristics of the real estate market is obvious, the data of cities' real state reflects the true characteristics of the real estate market better. The authors chose the real estate sales data of 1999–2010 of 35 cities. After calculating each city's increasing range of average price and Lerner Index of 1999–2010, we got the following data Table 39.7:

According to the results above, the authors made the inspection of the linear logarithmic of the range of variation of house price and the annual Lerner Index, the results are presented below:

$$\mathrm{Log(g)} = -1.300423 + 0.693153\mathrm{Log(L)}$$

$$\mathrm{t} = (-8.027268)(3.401730)\mathrm{r}^2 = 0.259621$$

According to the results above, deflective error coefficient 0.693153, shows that when the Lerner Index increases one percent, the range of price variation will rise 69.31 % indicating that the annual Lerner Index of the 35 cities' market has marked effects on the house price variation

Table 39.7 The analysis data of the 35 cities' house price of 1999–2010

City	Lerner Index (L)	The range of Price variation (g)	City	Lerner Index (L)	The range of Price variation
Beijing	1.183	0.186554	Qingdao	0.442	0.174647
Tianjin	0.572	0.164896	Zhengzhou	0.367	0.166765
Shijiazhuang	0.403	0.11501	Wuhan	0.511	0.154851
Taiyuan	0.519	0.179418	Changsha	0.347	0.135748
Hohhot	0.453	0.140617	Guangzhou	0.638	0.170938
Shenyang	0.333	0.118298	Shenzhen	0.646	0.479517
Dalian	0.491	0.123555	Nanning	0.383	0.105943
Changchun	0.363	0.131474	Haikou	0.63	0.192164
Harbin	0.562	0.113501	Chongqing	0.243	0.13861
Shanghai	0.922	0.179674	Chengdu	0.546	0.191542
Nanjing	0.588	0.167031	Guiyang	0.469	0.324786
Hangzhou	0.617	0.202468	Kunming	0.295	0.063712
Ningbo	0.833	0.31602	Xi'an	0.267	0.107182
Hefei	0.415	0.207847	Lanzhou	0.712	0.1321
Fuzhou	0.737	0.182972	Xining	0.335	0.133268
Xiamen	0.653	0.236318	Yinchuan	0.312	0.07395
Nanchang	0.354	0.139706	Urumqi	0.62	0.99148
Jinan	0.577	0.152432	–	–	–

39.6 Summary

In market economy, the formation of real estate price depends on the market conditions. The power comparison of supply and demand sides will have a direct impact on the real estate price changes. We proved theoretically that the magnitude of the house price changes is an increasing function of the Lerner index. Based on it, we choose the real estate market sales data of the nation, 30 provinces and 35 large and medium-sized cities as samples and estimate the effect of the nation's Lerner Index on the range of house price variation. It proved out that China's real estate price changes and the real estate market power present a positive correlation and the market power is one of the main factors influencing the changes of real estate price.

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