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LAND PRICE VARIATIONS AMONG CHINA'S REGIONS

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Abstract

China's land market developed rapidly in the last decade. In this paper, we seek to explore regional variations of land prices and examine determinants of such variations. A random sample of 190 cities is selected in Mainland China and Hainan Island. Data are obtained from various sources and cover the period 1986-1996. Descriptive statistics, GIS 3D analyst, and non-parametric tests are applied to explore the regional variations of land prices. Linear stepwise regression is employed to analyse the determinants of land prices. The empirical results reveal that land prices (commercial, residential and industrial) vary among regions. The coastal region, especially the Special Economic Zones and Open Coastal Cities, accommodate higher land prices than the non-coastal region. Guangdong and Fujian provinces have higher commercial and residential land prices than other provinces as a whole, which exclude Beijing and Shanghai. City size and industry size are two major determinants, which explain land price variations. Foreign investment intensity entered only the determination of commercial land prices. Thus the uneven distribution of foreign investment enlarges the gap of commercial land prices between the coastal region and the non-coastal region. This result explains that commercial land prices have more sever regional differences between the coastal region and the non-coastal region than residential land prices and industrial land prices do. State investment policy is a check on property market to prevent from over-investment in commercial properties. Quality of life has positive impact both on commercial and residential land prices. Urban infrastructure improvement has positive impact only on industrial land prices.

Keywords: Land Price, Regional Variation, China

Land Price Variations among China's Regions

Introduction

China's real estate market is perhaps the fastest changing one in today's global property market. Since 1979, China's government has started reform of land administration and housing distribution as a part of economic reform. Land use rights were separated from ownership and became tradable. State direct allocation and planning of land use has given way to market-oriented allocation (Qu, Heerink, and Wang, 1995; Dowall, 1993). Housing reform has converted welfare distribution without pay to a new distribution system by market mechanisms. China's real estate market has been evolving at a rapid speed. In the period 1992-1995, the annual growth rate of national real estate investment averaged at 71% (Zhong Fang, 1996).

In the last decade, a number of papers and articles on this emerging real estate market have been accumulated (Lim, 1995; Walker, 1991; Wong, 1998; Wang and Murie, 1996; Qu, Herrink and Wang, 1995; Dowall, 1993; Tang, 1989; Li, 1997; Chen, 1996; Li and Walker, 1996; Walker and Li, 1994; Tse et al, 1999). However, most of them mainly focus on the vertical dimension—the transition of land use and housing from a centrally planned system to a market-oriented system (Wong, 1998; Wang and Murie, 1996; Qu, Herrink and Wang, 1995; Dowall, 1993; Tang, 1989). While the explorations contribute to understanding the formation of the real estate market, little is known about the horizontal dimension—the regional variations of real estate market in China.

Yet the regional dimension is an indispensable part of China's economic reform and real estate development (Han, 1998). The vast territory and inequalities in resources endowment, state investment, and economic growth are research topics discussed by researchers (Sharkawy, Chen, and Pretorius, 1995; Cannon and Jenkins, 1990; Goodman, 1989). China's development has a clear regional dimension. Although policy measures were designated and implemented to prevent further increase in disparities between the coastal and non-coastal regions in the 1950s and the 1960s, the relative positions of regions did not change, with coastal region's per capita national income always higher than the others (Wei and Ma, 1996). Moreover, all these re-distributive policies gave way to a new one concentrated in the coastal region in the early 1979. China's government redirected resources, investment, and development priorities to the coastal region for economic efficiency (Fan, 1995; Yang, 1990, Zhou, 1993). In 1979 four Special Economic Zones (SEZs), viz. Shenzhen, Zhuhai, Shantou and Xiamen, were established. In 1984, 14 coastal cities (i.e., Dalian, Qinhuangdao, Tianjing, Yantai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhanjiang, and Beihai) were designated as Open Cities. In early 1985 the Lower Yangtze Delta, the Pearl River Delta and the Xiamen-Zhangzhou-Quanzhou Triangle were designated as Coastal Economic Development Zones (CEDZs). A series of preferential policies (e.g., tax breaks) was granted to the coastal region to attract foreign investment (Han and Wong, 1994).

Therefore, questions may be raised as how does the land market in China reflect the regional dimension that has been built-in China's economy. What are the regional variations of land prices? What are the determinants that explain the variations of land prices? Few observations and studies have been on regional variations in China's real estate market. Yang (1993) observed that cities and regions that started earlier in economic reform were relatively

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advanced in real estate development than those in the rest of the country. Ru (1993) saw that the sources of investment and the flow of domestic and foreign capital on real estate varied from region to region. Han (1998) found that coastal region had more active real estate market than non-coastal region. The purpose of this article is to explore regional variations and determinants of land prices in China.

Research Design

Hypotheses

Since formation of China's real estate market is the result of economic reform, one may wonder whether the economic reform has generated regional patterns in land prices. What are the main forces that shape the regional patterns of land prices? Two hypotheses are postulated:

1. Land prices vary among regions.

As economic development and opening up are pushed from the eastern region towards the western region, we further draw two sub-hypotheses. 1) The eastern region has higher land prices than the central region, while the latter has higher land prices than the western region (Figure 1);[1] 2) Land prices in the coastal region are higher than those in the non-coastal region (Figure 2).[2] As Special Economic Zones, Open Coastal Cities, Guangdong and Fujian provinces have been granted with more preferential policies, additional two sub-hypotheses are developed. 3) Land prices in the group of the four Municipalities directly under the Central Government (MDUCG), four Special Economic Zones (SEZs), and fifteen Open Coastal Cities (OCCs) are higher than those in the rest cities in China (Figure 3).[3] 4) The same is also applicable to Guangdong & Fujian provinces vs. the rest provinces (Figure 4).

2. Land prices are determined by regional policy factor (RP), demographic factor (DM), macro-economic factor (ME), and land-use factor (LU), such as city size, industry size, GDP per capita, etc. The function of land price (LP) can be denoted as equation 1.

LP=F (RP, DM, ME, LU)   Equation 1

Data and Methods

In Equation 1, land price (LP) is classified as commercial, residential and industrial land prices by land uses.

RP (regional policy factor) includes two dummy variables Vco and Vsp, which are included to test the direct effect of regional policies on land prices.
      1). Vco=1 in coastal cities, while Vco=0 in non-coastal cities.
      2). Vsp=1 in Municipalities directly under the Central Government, Special Economic Zones and Open Coastal Cities, while Vsp=0 in the rest cities.

DM (demographic factor) includes variables related to population.
      3). FNRK is total urban non-agricultural population, which measures city size. This variable is only included in the equations of commercial and residential land prices.
      4). ZGRS is total number of employees. This variable is an indicator of industry size, thus only included in the equation of industrial land price.

5). JZMJ is living space per capita, which indicates quality of life.

ME (macro-economic factor) measures macro-economic activity. ME includes the following variables:

6). RJGDP is gross domestic product per capita. This variable indicates social productivity.

7). GYBL is the ratio of total industrial output value to GDP. This ratio reflects economic structure.

8). RJTZ is fixed asset investment per capita. This variable measures investment intensity.

9). ZZTZBL is the ratio of housing construction investment to total fixed asset investment. This ratio measures investment structure and further reflects state investment policy.

10). RJHY is cargo transport per capita, which is by land, water and airline. This variable reflects regional transportation infrastructure.

11). RJYD is post and telecommunication service per capita. This variable indicates availability and level of telecommunication services in a city.

12). RJWM is per capita stock purchased for export. This variable is used to measure the export component in the whole economy and analyse economic base.

13). RJWSTZ is foreign direct investment per capita. This variable measures foreign investment intensity.

14). RJCX is savings deposit per capita. This variable reflects household income and substantial consumption power.

15). RJDK is bank credit per capita. This indicator measures availability of funds invested in real estate from financial institutions.

16). RJXF is consumer goods sale per capita. This variable is real consumption power, compared to RJCX (savings deposit per capita).

17). SCGB is the ratio of tertiary industry GDP to total GDP. This variable indicates social industry structure.

LU (land-use factor) depicts land use planning in cities.

18). DLBL is the ratio of road area to total city area. This variable reflects urban infrastructure condition.

A random sample of 190 cities is selected in Mainland China and Hainan Island (Figure 1). Land prices are obtained from Estate Price of China 1996 and Yearbooks of the Land of China 1994 and 1995, which are edited by State Land Administration Bureau of P.R.C., and other municipal land price materials (e.g. Shanghai Municipality Baseline Land Prices, 1998), which are edited by local municipalities. These Baseline Land Prices were effective in 1996. The data of the independent variables included in Equation 1 are collected from Urban Statistical Yearbooks of China 1986-1996, which are edited and published by State Statistical Bureau of P.R.C. These data cover the period 1986-1996 and are averaged per period for eliminating variations over time.[4]

In this study, descriptive statistics, GIS 3D analyst, and non-parametric tests are applied to explore the regional variations in land prices (hypothesis 1).[5] Non-parametric tests are applied, because they require no restrictive assumption of normal distribution of land price data. Since variations over time are eliminated with averaged data, Mann-Whitney tests are applied to test regional difference of two independent samples, and Kruskal-Wallis tests are

applied to test regional difference of three independent samples. Multiple linear stepwise regression is employed to analyze the determinants of land prices (hypothesis 2).[6]

Regional Variations of Land Prices

Regional Pattern of Commercial Land Price

On the national scale, commercial land price registers a standard deviation of 2957.68 and a range of 35,066 RMB yuan/m^2. The highest commercial land price is 35,192 RMB yuan/m^2 in Shanghai, and the lowest is 126 RMB yuan/m^2 in Shuangyashan. Shanghai is known as an economic and financial center in eastern China. Shuangyashan is a small county level city in Heilongjiang province, which is located in central region. Figure 5 shows that cities with high commercial land prices are located in coastal region. Commercial land prices in Special Economic Zones and Open Coastal Cities are among the highest.

Descriptive statistics and non-parametric tests confirm regional variations in commercial land prices. Eastern region has higher commercial land price than the central and western regions, as the mean in eastern region is 2,811.92 RMB yuan/m^2, more than twice of those in central and western regions (1113.69 and 1155.30 RMB yuan/m^2 respectively). Eastern region has mean rank of 121.16, almost the twice of those of central and western regions (61.29 and 63.24). The commercial land prices in central and western regions are close to each other. Coastal region has much higher commercial land prices than non-coastal region, as the former has mean rank of 121.16 higher than 62.10 in the latter.

Municipalities directly under the Central Government, Special Economic Zones, and Open Coastal Cities have higher commercial land prices than the rest cities, as the former has higher mean in descriptive statistics and higher mean rank in Mann-Whitney test. Guangdong and Fujian provinces have higher commercial land prices than other provinces, which exclude Beijing and Shanghai. This result suggests that the opening up and preferential policies have benefited commercial land prices in Special Economic Zones and Open Coastal Cities more than in other cities.

Regional Pattern of Residential Land Price

Figure 6 shows that residential land prices in coastal region are higher than those in non-coastal region. The highest residential land price is 28,012.50 RMB yuan/m^2 in Shanghai, and the lowest is 95.70 RMB yuan/m^2 in Qitaihe, Heilongjiang province.

Eastern region has higher residential land price than central and western regions, as shown in Table 3. Coastal region has higher residential land prices than non-coastal region. Kruskal-Wallis test presents the same results in Table 4. Further, Mann-Whitney test suggests that coastal region has higher residential land price than the non-coastal region, while little difference was detected between the central and western regions.

Both of descriptive statistics and Mann-Whitney test confirm that residential land prices in Municipalities directly under the Central Government, Special Economic Zones and Open Coastal Cities are higher than those in the rest cities. Although there is little gap with means, Mann-Whitney test reveals that Guangdong and Fujian provinces have higher residential land prices than other cities, which exclude Beijing and Shanghai.

Regional Pattern of Industrial Land Price

Industrial land price varies among regions (Figure 7). The highest industrial land price is 8,495.00 yuan/m^2 in Beijing, and the lowest is 59.96 yuan/m^2 in Qujing, Yunnan province, in western region.

As shown by the means in Table 5 and mean ranks in Table 6, eastern region has the highest industrial land price among three regions, while there is little difference between the central region and the western region. Coastal region has higher industrial land prices than non-coastal region.

Municipalities directly under the Central Government, Special Economic Zones and Open Coastal Cities have higher industrial land prices than the rest cities, for the former has higher industrial land price mean. Mann-Whitney test reveals the same result by showing the mean rank of 157.60 in the former and 85.56 in the latter. But little difference of industrial land prices between Guangdong and Fujian provinces vs. other provinces is detected.

As seen in Figure 5, 6, and 7, the coastal region accommodates all high land prices. Land prices in Shanghai, Beijing, Guangzhou and Shenzhen are among the highest. Evidently, cities form groups as we discern in Figure 5, 6, 7, in areas of the Beijing-Tianjin area, the Yangtze River Delta, and the Pearl River Delta. By comparing Figure 5, 6, 7, we find that commercial land price varies more extensively than residential and industrial land prices do.

Determinants of land Prices

Linear Stepwise Regression on Commercial Land Price

Four independent variables, viz. FNRK (total non-agricultural population), RJWSTZ (foreign direct investment per capita), ZZTZBL (ratio of housing construction investment to total fixed asset investment), and JZMJ (living space per capita), entered the model of commercial land price at the significance level of 0.05. Together they explained 71.10 percent of the total variation of commercial land prices. Among them, FNRK explained 61.80 percent. RJWSTZ added the another 6.10 percent. The third independent variable ZZTZBL and the fourth JZMZ explained 2.10 and 1.10 percent respectively. The equation passed significance tests and collinearity diagnostics.

City size

The positive coefficients (B=31.225 and Beta=0.816) imply that commercial land price rises as city size increases. Large size cities have economic advantages: economies of scale and economies of public sector services, and non-economic advantages: social cultural benefits (Foo, 1998/1999). In China, limited potential supply of commercial land partially accounts for high commercial land prices in large size cities. In large size cities, there are few raw or vacant land parcels for commercial development. High construction density and limited infrastructure constrict floor area ratios. Commercial land redevelopment cost, which includes compensation for occupiers' resettlement and site disposal, is higher in large cities than in small cities. For example, compensation fee in Beijing, Shanghai and Guangzhou is among the highest in China. Second, large potential demand for commercial land is the major factor for high prices in large cities. Larger population size in large cities demands for more commercial facilities, such as shopping centers, cinemas, etc. The large number of companies

forms strong demand for office space. Other than serving local population and companies, large cities also provide commercial properties for company branches and even headquarters from surrounding areas.

Foreign Investment Intensity

Foreign investment, as an indicator of open policy, is favorable to the growth rate of Chinese cities (Han and Wong, 1994). Similarly, foreign investment is the most significant variable impacting the spatial trends of urban development in China (Sharkawy etc., 1995).

In this model, the coefficient of RJWSTZ (foreign direct investment per capita) shows a positive impact of foreign investment intensity on commercial land prices. That foreign investment boosts commercial land prices explains higher commercial land prices in coastal region, Municipalities directly under the Central Government, Special Economic Zones, Open Coastal Cities, and Guangdong and Fujian Provinces. Similarly, Han (1998) found that international capital was the main factor for intensive development of real properties in coastal market. In real estate market, foreign investment boosts demand for commercial properties in indirect way and direct way. Indirectly, establishment of foreign investment companies, in forms of wholly foreign-owned enterprises, equity joint ventures, contract joint ventures, joint exploration companies, compensation trade enterprises and industrial processing enterprises, increases demand for office space. In fact, these foreign investment companies have become pioneer occupiers of grade A office buildings in China, because of their high requirement of office environment and high affordability. In 1998, some of the giant companies, such as Motorola and HP, began to own office buildings in Beijing. Meanwhile, overseas employees in foreign investment companies are the earliest customers of luxury clubs and lessees of top grade business apartments. In the direct way, foreign capital invested in real estate is a major capital source for commercial properties in China (Zhang, 1995). Foreign capital in real estate sector was the pioneer in developing commercial properties, such as shopping centers, top grade hotels, private apartments, etc. Foreign capital accounts for more than 10 percent of total real estate development investment (15.3% in 1994; 12.6% in 1995; and 13.3% in 1996, Yearbook of China Real Estate Market 1996 and 1997).

State Investment Policy

State investment policy is a tool used by the government to intervene in urban land market. The state is the major fixed asset investor. The fixed asset investment by other ownership enterprises is also under the state planning. Thus, the structure of fixed asset investment can be employed as the indicator of state investment policy.

In this model, the negative coefficient indicates that commercial land prices go downwards, as the ratio of housing construction investment to the total fixed asset investment increases. First, increase of housing construction investment in fixed asset investment may probably compete for investment in commercial development. Second, China's government has taken effort to balance real estate investment and development among commercial, residential and industrial properties by limiting commercial real estate investment while encouraging residential and industrial property investment, because unbalance in real estate development is overheating in commercial real estate development.

Quality of Life

Living space per capita is a key determinant of quality of life in China (Xiaokang bu Xiaokang, Guanjian Kan Zhufang). At this stage, when the average living space per capita is less than 9.0 sq. m., the objective in the ninth five-year plan, increase of living space per capita will much help improve quality of life.[7]

The equation shows positive impact of high quality of life on commercial land prices. High quality of life creates potential demand for other commercial services in life. Second, large living space directly increases consumption of decoration, furniture, electronics, etc. These two points are likely to be favorable for commercial land prices.

Multiple Linear Stepwise Regression on Residential Land Price

Two independent variables, viz. FNRK (total non-agricultural population) and JZMJ (living space per capita), entered the model of residential land price. Together they explained 71.2 percent of the total variation of residential land prices. FNRK entered first and explained 68.70 percent. JZMJ added another 2.5 percent.

City Size

City size has positive impact on residential land prices for the similar reasons in the determination of commercial land prices. First, limited potential supply of residential land accounts partially for high residential land prices in large size cities, due to high construction density and limited infrastructure. Residential land redevelopment cost is higher in large cities than in small cities, as compensation for occupiers' removal and site disposal are much more costly in large cities. Second, large potential demand for housing also accounts for high residential land prices in large cities. Local population together with in-migration population from surrounding areas forms powerful demand for housing space.

Quality of Life

As shown in the equation, high quality of life has positive impact on residential land prices. For this result, one may have the question why the demand for housing space is high in the cities with large living space per capita. As in the proceeding statement, there is still a gap between the current living space and the objective in 2000, which is still far below the level in developed countries. *Relatively* high living space per capita compared with other cities will not weaken demand for housing space. Moreover, under welfare housing distribution system, where institutions are major purchasers, *relatively* high living space per capita will not hinder institutional housing consumption.

Thus, uneven distribution of city size can explain major part of the uneven distribution of commercial and residential land prices in China. The average city size in eastern region is larger than that in central region and western region. In 1996, urban non-agricultural population in eastern cities averaged at 358,664. This figure was greater than the average urban non-agricultural population in the central region (287,033), in the western region (248,667), and also in the combination of central region and western region (274,210 in non-coastal region).

Living space per capita varies among China's cities. In 1993, Living space per capita in eastern cities, central cities and western cities were 8.36 m^2, 7.15 m^2, and 7.38 m^2 respectively. Special Economic Zone cities had the largest living space per capita of 10.83 m^2, which was much higher than 7.81 m^2 per capita of the whole state. Thus quality of life is among the factors, which explain the regional variations of commercial and residential land prices in China.

Multiple Linear Stepwise Regression on Industrial Land Price

Two independent variables, ZGRS (total number of employees) and DLBL (ratio of road area to total city area), entered the model of industrial land prices. Together they explained 72.4 percent of the total variation of industrial land prices. Among them, ZGRS explained 70.1 percent, while DLBL added another 2.3 percent.

Industry Size

Industry size is the major determinant of industrial land prices. The positive coefficient implies that large industry size increases industrial land prices. Cities with larger industry sizes enjoy benefits of scale economies. First, there is adequate skilled labor force available for production expansion. Second, factories can easily purchase raw materials and semi-processed products and sell final products.

Urban Infrastructure Condition

Improvement of urban infrastructure has positive impact on industrial land prices. First, industrial production requires a large amount of transportation of raw materials and products. A city with better transportation infrastructure is more attractive for investors than one without good transportation condition. Further, good transportation condition can reduce freight costs, thus maximize operation profits.

The presence of foreign investment intensity in the model of commercial land prices may explain intensive variation of commercial land prices. Total variations explained by the determinants were around 70% in each model, but the variation proportion explained by each determinant varied. City size explained 61.8% of variation in commercial land prices because foreign investment intensity explained another 6.1%, while city size explained 68.7% of the variation in residential land prices. Industry size explained 70.1% in industrial land prices. As opening up and foreign investment has clear regional dimensions, the presence of foreign investment intensity has intensified regional variations of commercial land prices.

Foreign investment intensity is absent in the determination of residential and industrial land prices. Foreign investment has small proportion invested in residential real estate sector, which is dominated by state and collective enterprises, thus has little impact on residential land prices. However, the question is why foreign investment intensity is absent in the model of industrial land prices. Industrial land is often located in newly developed area and is in form of economic or industry development zones with large amount of land area. The major providers of industrial land are local governments. For local benefits, some local governments illegally transfer industrial land to foreign investors in form of whole leasing at abnormally low prices (Tian, 1994). Thus, the surplus supplies and low prices of industrial land offset the impact of foreign investment intensity on industrial land prices and explain the absence of foreign investment density in the model of industrial land prices. This is the best

reason for little difference in industrial land prices between Guangdong & Fujian provinces vs. the rest provinces.

Conclusions

China's real estate market, which has developed at a high speed since economic reforms and open policies were introduced in 1978, has clear regional dimensions. This study proves that such regional dimensions also exist in China's land market. Eastern region has higher land prices than the central region and the western region. There is a sharp difference in land prices between the coastal region and the non-coastal region, while there is little difference within the non-coastal region. Municipalities directly under the Central Government, Special Economic Zones and Open Coastal Cities have significantly higher land prices than the rest cities. Commercial land prices and residential land prices in Guangdong and Fujian provinces are higher than those in other provinces, which exclude Beijing and Shanghai. Commercial land prices vary more extensively than residential land prices and industrial land prices. This result suggests that opening up to foreign investment has benefited real estate development so that Municipalities directly under the Central Government, Special Economic Zones, Open Coastal Cities, Guangdong and Fujian provinces have more active land markets than others. This study implies that regional land price variations have reflected the opening up and economic development patterns that economic development is pushed from the eastern region to the western region. Three-ladder development policy and open coastal region policy have generated regional dimensions in China's land market.

Commercial land price and its variations are determined by city size, foreign investment intensity, state investment policy, and quality of life. Similarly, residential land price is determined by city size and quality of life. Industrial land price is shaped by industry size and urban infrastructure condition. Among the determinants, city size explained more than 60% of the variations in commercial land prices and residential land prices. Similarly, industry size is the most significant factor responsible for the variations of industrial land prices.

The findings in this study may explain some phenomena in China's real estate market. Large cities or cities with large industry sizes have advantages in real estate development. Special Economic Zones and Open Coastal Cities have higher commercial land prices than other cities, because commercial land prices are sensitive to foreign investment. But over-supply and low pricing of industrial land by local governments have offset impact of foreign investment on industrial land prices, thus foreign investment intensity is absent in the determination of industrial land prices. For example, although Guangdong and Fujian provinces are opened much ahead of the others, their industrial land prices are close to those in the others. The state investment policy, which encourages housing construction investment and limits commercial development, has played an important role towards the balance among commercial, residential and industrial properties. The idea that effective way to get rich is to build roads (Yao Xiang Fu, Xian Xiu Lu) is proved to be true, because good urban infrastructure can help gather industrial capital investment.

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Table 1. Descriptive Statistics of Commercial Land Prices, by Region, 1996

Regions	N	Range	Min	Max	Mean	Std. Dev.	C. V.
Nation	187	35066	126	35192	2038.93	2957.68	1.45
Eastern Region	101	34692	500	35192	2811.92	3784.15	1.35
Central Region	50	3874	126	4000	1113.69	875.01	0.79
Western Region	36	3445	170	3615	1155.30	867.59	0.75
Coastal Region	101	34692	500	35192	2811.92	3784.15	1.35
Non-coastal Region	86	3874	126	4000	1131.11	867.03	0.77
MDUCG, SEZs, OCCs	16	33092	2100	35192	6776.84	8305.48	1.23
The Rest Cities	171	5124	126	5250	1595.61	1083.62	0.68
Guangdong & Fujian	46	5000	500	5500	2508.72	1280.04	0.51
The Rest Provinces	141	35066	126	35192	1885.66	3316.53	1.76

Note: 1. C. V.—Coefficient of Variance
2. MDUCG—Municipalities directly under the Central Government
3. SEZs—Special Economic Zones
4. OCCs—Open Coastal Cities
5. *Land Price is in RMB yuan/m^2. $ 1 US dollar was about 8.28 RMB yuan in October 1999.*
6. Data of commercial land prices in three sample cities are unavailable.

Table 2. Non-parametric Tests of Regional Variations of Commercial Land Prices

Groups	N (187)	Mean Rank	Sig. Level
Eastern/Central/Western	101/50/36	121.16/61.29/63.24	0.000
Central/Western	50/36	43.13/44.01	0.871 (2-tailed)
Coastal/Non-coastal	101/86	121.16/62.10	0.000 (2-tailed)
MDUCG, SEZs and OCCs/the rest cities	16/171	165.22/87.34	0.000 (2-tailed)
Guangdong and Fujian/the rest provinces	46/141	126.93/83.26	0.000 (2-tailed)

Note: 1. MDUCG—Municipalities directly under the Central Government
2. SEZs—Special Economic Zones
3. OCCs—Open Coastal Cities
4. Data of commercial land prices in three sample cities are unavailable.

Table 3. Descriptive Statistics of Residential Land Prices, by Region, 1996

Regions	N	Range	Min	Max	Mean	Std. Dev.	C. V.
Nation	183	27917	96	28013	835.94	2300.67	2.75
Eastern Region	100	27843	170	28013	1137.08	3067.08	2.70
Central Region	50	1104	96	1200	415.97	230.00	0.55
Western Region	33	2429	109	2538	559.69	531.79	0.95
Coastal Region	100	27843	170	28013	1137.08	3067.08	2.70
Non-coastal Region	83	2442	96	2538	473.11	383.38	0.81
MDUCG, SEZs, OCCs	15	27513	500	28013	3976.00	7438.51	1.87
The Rest Cities	168	2704	96	2800	555.58	406.47	0.73
Guangdong & Fujian	46	2230	170	2400	738.80	417.70	0.57
The Rest Provinces	137	27917	96	28013	868.55	2649.79	3.05

Note: 1. C. V.—Coefficient of Variance
2. MDUCG—Municipalities directly under the Central Government
3. SEZs—Special Economic Zones
4. OCCs—Open Coastal Cities
5. Land Price is in RMB yuan/m^2. $ 1 US dollar was about 8.28 RMB yuan in October 1999.
6. Data of residential land prices in seven sample cities are unavailable.

Table 4. Non-parametric Tests of Regional Variations of Residential Land Prices

Groups	N (183)	Mean Rank	Sig. Level
Eastern/Central/Western	100/50/33	109.44/66.60/77.64	0.000
Central/Western	50/33	40.13/44.83	0.384 (2-tailed)
Coastal/Non-coastal	100/83	109.44/70.99	0.000 (2-tailed)
MDUCG, SEZs and OCCs/the rest cities	15/168	159.37/85.99	0.000 (2-tailed)
Guangdong and Fujian/the rest provinces	46/137	115.93/83.96	0.000 (2-tailed)

Note: 1. MDUCG—Municipalities directly under the Central Government
2. SEZs—Special Economic Zones
3. OCCs—Open Coastal Cities
4. Data of residential land prices in seven sample cities are unavailable.

Table 5. Descriptive Statistics of Industrial Land Prices, by Region, 1996

Regions	N	Range	Min	Max	Mean	Std. Dev.	C. V.
Nation	182	8435	60	8495	466.22	829.58	1.78
Eastern Region	99	8385	110	8495	588.46	1084.34	1.84
Central Region	50	714	66	780	267.60	139.68	0.52
Western Region	33	2070	60	2130	400.42	386.75	0.97
Coastal Region	99	8385	110	8495	588.46	1084.34	1.84
Non-coastal Region	83	2070	60	2130	320.41	272.59	0.85
MDUCG, SEZs, OCCs	15	8195	300	8495	1697.45	2508.40	1.48
The Rest Cities	167	2070	60	2130	355.63	265.43	0.75
Guangdong & Fujian	46	1006	118	1124	378.42	190.43	0.50
The Rest Provinces	136	8435	60	8495	495.91	952.42	1.92

Note: 1. C. V.—Coefficient of Variance
2. MDUCG—Municipalities directly under the Central Government
3. SEZs—Special Economic Zones
4. OCCs—Open Coastal Cities
5. Land Price is in RMB yuan/m^2. $ 1 US dollar was about 8.28 RMB yuan in October 1999.
6. Data of industrial land prices in eight sample cities are unavailable.

Table 6. Non-parametric Tests of Regional Variations of Industrial Land Prices

Groups	N (182)	Mean Rank	Sig. Level
Eastern/Central/Western	99/50/33	106.14/65.72/86.65	0.000
Central/Western	50/33	38.64/47.09	0.118 (2-tailed)
Coastal/Non-coastal	99/83	106.14/74.04	0.000 (2-tailed)
MDUCG, SEZs and OCCs/the rest cities	15/167	157.60/85.56	0.000 (2-tailed)
Guangdong and Fujian/the rest provinces	46/136	98.59/89.10	0.291 (2-tailed)

Note: 1. MDUCG—Municipalities directly under the Central Government
2. SEZs—Special Economic Zones
3. OCCs—Open Coastal Cities
4. Data of industrial land prices in eight sample cities are unavailable.

Table 7. Summary of Linear Stepwise Regressions: COMLP, RESLP and INDLP

Model	Dependent Variable	R	R^2	Adjusted R^2	F-value	Sig. Level	Standard Error
1	COMLP	0.850	0.723	0.711	61.232	0.000	1940.29
2	RESLP	0.848	0.718	0.712	114.743	0.000	1544.87
3	INDLP	0.854	0.730	0.724	121.471	0.000	402.63

Note: F-value—the Variance Ratio.

      COMLP—Commercial Land Price.

      RESLP—Residential Land Price.

      INDLP—Industrial Land Price.

Table 8. Coefficients of Linear Stepwise Regressions of Land Prices

Equations	Independent Variables	Unstandardized Coefficients		St. Coefficients	t-value	Sig.	Collinearity Statistics
		B	Std. Error	Beta			VIF
COMLP	Constant	-1663.206	1468.320		-1.133	.260	
	FNRK	31.255	2.126	0.816	14.690	.000	1.046
	RJWSTZ	2.815	0.879	0.208	3.203	.002	1.436
	ZZTZBL	-7938.072	3273.846	-0.136	-2.425	.017	1.067
	JZMJ	418.165	196.961	0.138	2.123	.036	1.436
RESLP	Constant	-3363.967	968.509		-3.473	.001	
	FNRK	25.751	1.700	0.862	15.147	.000	1.034
	JZMJ	401.083	134.842	0.169	2.974	.004	1.034
INDLP	Constant	-118.091	63.421		-1.862	.066	
	ZGRS	10.218	0.795	0.770	12.844	.000	1.195
	DLBL	260.579	90.416	0.173	2.882	.005	1.195

Note: VIF—Variance Inflation Factor.

      COMLP—Commercial Land Price.

      RESLP—Residential Land Price.

      INDLP—Industrial Land Price.

      FNRK—total non-agricultural population.

      RJWSTZ—foreign direct investment per capita.

      ZZTZBL—ratio of housing construction investment to total fixed asset investment.

      JZMJ—living space per capita.

      ZGRS—total number of employees.

      DLBL—ratio of road area to total city area.

Note

[1] Eastern region includes Beijing, Tianjin, Shanghai, and nine provinces (i.e., Liaoning, Hebei, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong, Guangxi and Hainan). Central region includes nine provinces (i.e., Heilongjiang, Jilin, Neimengu, Shanxi, Henan, Hubei, Hunan, Anhui, and Jiangxi). Western region includes Chongqing and nine provinces (i.e., Sichuan, Yunnan, Tibet, Guizhou, Shanxi, Gansu, Qinghai, Ningxia, and Xinjiang).

[2] Coastal region is the same as the eastern region, while the non-coastal region is the combination of the central region and the western region.

[3] The group of Municipalities directly under the Central Government, Special Economic Zones and Open Coastal Cities includes cities of Beijing, Tianjin, Shanghai, Chongqing, Shenzhen, Zhuhai, Shantou, Xiamen, Dalian, Qinghuangdao, Qingdao, Yantai, Weihai, Lianyungang, Nantong, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhanjiang, and Beihai.

[4] The averaged data reflect socio-economic development level in China better than annual data, because fluctuations of economic development, such as crackdown caused by student demonstration in 1989, are eliminated.

[5] In descriptive statistics analyses, means of land prices ignore land price differences within regions, while they indicate regional land price levels. Full analyses for 190 cities in non-parametric tests, i.e. Mann-Whitney tests and Kruskal-Wallis tests, provide more accurate information about the regional variations of land prices by considering land price variations within regions.

[6] For this study mainly focuses on analyses on nation-wide and among regions, most analyses within regions are omitted.

[7] In 1993, the average living space per capita in all Chinese cities is 7.81 m^2, which is less than 9.0 m^2, the objective in the end of 2000.