

Research on the Spatial Distribution of Urban Real Estate Development Investment in China

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Abstract: For a long time, real estate development investment has shown the spatial phenomenon of clustering and distribution in large cities. This paper attempts to discuss the spatial distribution of urban real estate development investment in China. In this study, through theoretical analysis, the theory of influencing factors of the spatial distribution of real estate development investment in China is concluded, and six research hypotheses are proposed respectively. Based on the test of the Spatial Dubin Model (SDM), the following empirical conclusions are drawn. First, there is an obvious spatial aggregation phenomenon in the urban real estate development investment in China. Second, urbanization is not conducive to the spatial aggregation of urban real estate development investment in China. Third, the industrial structure is not conducive to the spatial aggregation of urban real estate development investment in China. Fourth, the growth of GDP per capita is conducive to the spatial aggregation of urban real estate development investment in China. Fifth, the level of housing prices is not conducive to the spatial aggregation of real estate development investment.

1. Introduction

In China, urban real estate development investment is an important component of urban fixed asset investment. It plays an important role in urban economic development, because real estate investment is related to the prosperity of many industries such as industrial raw materials, construction, decoration, household appliances, commercial leasing, machinery, and etc. However, the spatial distribution of urban real estate development investment in China has been presenting an unbalanced phenomenon for a long time. The proportion of investment in urban real estate development in the eastern region far exceeds that in the central and western regions, with the western region ranking last in China. Moreover, real estate development investment also presents a spatial phenomenon of clustering and distribution in large cities, that is, the dominant force of real estate development investment in large cities far exceeds that of surrounding small and medium-sized cities, and gradually siphons the scale of real estate investment in small and medium-sized cities.

In this environment of spatially aggregated distribution of real estate development and investment, the real estate market in large cities began to oversupply, and the level of housing prices grew at a high rate to further attracts more capital [1]. Although small and medium-sized cities have also developed some property market projects, the level of market prosperity is far less than that of large cities, resulting in the problem of a high inventory of real estate. Therefore, the dislocation of supply and demand of real estate development in large, medium and small cities has become the primary obstacle to the healthy development of China's urban real estate industry. Meanwhile, with the outbreak of the COVID-19 epidemic in 2020, the Chinese government has issued a regulatory policy of "Three Red Lines" for real estate companies. This regulatory type of strong supervision has further restricted the impulse of households to purchase real estate and lengthened the return cycle of real estate development investment funds. Therefore, this paper discusses the spatial distribution of urban real estate development and investment in China, and gives suggestions for

spatial planning accordingly.

2. Review of Relevant Literature on The Spatial Distribution of Real Estate Development Investment

2.1 International Literature

Through an empirical study of large cities in Tennessee, Cho et al. (2006) found that real estate development investment in densely populated areas has an obvious spatial distribution correlation. Aguirre and Marmolejo (2011) analyzed the spatial distribution of real estate investment in the Barcelona metropolitan area, and found that the spatial distribution of this polycentric city shows a spatial trajectory that follows the value distribution [2]. Alkay (2015) also mentioned in a theoretical analysis that factors such as housing accessibility, housing environment quality, and housing stock size significantly affect the diversity and heterogeneity of the spatial distribution of real estate investment. Gabriel and Abraham (2011) believes that rapid urbanization would lead to insufficient investment in real estate, as well as a shortage of urban housing space distribution.

2.2 Literature within China

Yu Wei et al. (2015) constructed an econometric model based on provincial panel data and found that the capital stock of urban infrastructure has a significant effect on the spatial distribution of real estate development investment, and the eastern region is more constrained than the central and western regions. Using China's provincial panel data from 1997 to 2015, Li Jing and Xu Yingjie (2018) studied through the empirical model and found that the spatial distribution of urban real estate development investment is affected by transportation infrastructure. Taking Henan Province as an example, Zhou Xiaoying (2019) found that there are spatial differences in real estate investment in this area. Tian Xia and Cai Yinying (2020) analyzed the investment space distribution of leading real estate enterprises and found that the spatial distribution of these regions is concentrated in the Beijing-Tianjin-Hebei area, Yangtze River Delta and Pearl River Delta area. The analysis result showed that investment geography tends to be centralized [3]. Using Spatial Econometric Models, You Youyang and Yang Haoran (2021) found that the opening of G-series high-speed rail in prefecture-level cities could promote the aggregation of real estate investment.

2.3 Literature Review

Following the previous research, it can be found that there is an obvious spatial distribution effect in real estate development investment, which is mainly due to the urbanization policy in China that promotes large cities to possess a unique investment environment such as industrial structure, talents, and capital, as well as real estate investment. In China, real estate development investment is mainly concentrated in the Beijing-Tianjin-Hebei area, Yangtze River Delta area and Pearl River Delta area, where infrastructure construction also drives real estate investment. However, there have been too many studies that focused on the spatial spillover effect of infrastructure and urbanization on real estate development investment, without paying attention to comparative analysis of different regions. This paper attempts to examine the influencing factors of the spatial distribution of real estate development investment, and compare the differences among the Eastern, Central and Western regions in China to fill the gaps in the existing literature [4].

3. Influencing Factors of the Spatial Distribution of Urban Real Estate Development Investment in China

3.1 Urbanization Level

Urbanization is the process of transforming rural population into urban population. It also features the laws of industrial transformation, public infrastructure construction, scientific and technological progress, and social productivity improvement. In the process of urbanization, more and more population would be attracted, prompting the demand for housing and giving rise to a

huge demand for real estate [5]. Meanwhile, as the population continues to gather, living conditions in urban areas are more scarce, so real estate prices will also rise and trigger an increase in demand for speculative real estate purchases. Therefore, both logics are major factors in the aggregation of investment in urban real estate development.

Research hypothesis 1: There is a spatial spillover effect of urbanization level on real estate development investment.

3.2 Economic Development Level

Economic development is an important basis for the development potential of real estate, the more developed the economy, the higher the per capita income, which will also attract the growth of real estate investment. This is also attributed to the fact that developed regions have better supporting industries for real estate development and are less susceptible to negative economic shocks. Moreover, the developed regions have a high investment market potential and higher demand and budget for housing, which also attracts real estate development.

Research hypothesis 2: The improvement in GDP per capita provides a spatial spillover effect on real estate development investment.

3.3 Industrial Development Level

From the perspective of industrial structure, the development of the tertiary industry forms the demand for high-end office buildings and commercial business premises, while the secondary industry forms the demand for industrial plants and supporting office buildings [6]. The land price of the tertiary industry is generally higher, so the scale of development investment is usually larger. Especially in large cities with developed tertiary industries. In fact, there is often a close relationship between urban real estate development and urban planning.

Research hypothesis 3: The proportion of the tertiary industry has a spatial spillover effect on real estate development investment.

3.4 Real Estate Price Level

Real estate prices level reflect the supply and demand relationship of urban real estate. It is also the basis for decision-making in real estate development and investment, since the faster the housing price rises, the higher the profits of real estate development and investment will be, prompting the scale of development investment. Moreover, areas with high property prices indicate that such areas are suitable for the development of high-class properties, such as high-class office buildings, high-class neighborhoods, villas, etc.

Research hypothesis 4: The prices of real estate have a spatial spillover effect on real estate development investment.

3.5 Transportation Infrastructure

The improvement of transportation infrastructure facilitates the flow of trade and production materials, as well as the supply and flow of real estate development. Besides, a convenient transportation network is more conducive to spatial accessibility, not to mention that a perfect transportation network reduces transportation costs [7]. As a type of public infrastructure, transportation infrastructure promotes the transaction and distribution of market resources, improves the spatial accessibility of suburban real estate, increases housing prices along the transportation infrastructure, and promotes the scale of real estate development investment.

Research hypothesis 5: Transportation infrastructure investment has a spatial spillover effect on real estate development investment.

3.6 Scale of Foreign Investment

The real estate investment projects of foreign capital are often high-end brands. On the one hand, it is in line with the foreign investment policy of China, which can alleviate the pressure of competing companies in China. On the other hand, it contributes to the increase of the average level of housing prices. From the case of Hong Kong Chong Pang Group's investment, it is noted that in

recent years, urban cities in China are aiming to improve their urban landscape by introducing foreign investment to build landmark commercial buildings, which inevitably leads to a high-end trend in overall real estate projects.

Research hypothesis 6: There is a spatial spillover effect of foreign direct investment on real estate development investment.

4. Research Design

4.1 Model Introduction

According to the spatial econometric model, there are the following formulas. y represents the dependent variable, X represents the independent variable, ε represents the random error, W represents the spatial weight matrix of each area i , and W_{ij} represents the distance weight between the area i and the Surrounding Area j . In the model, ρ represents the influence coefficient of the dependent variable in the adjacent area on the dependent variable in the observed area [8].

$$y_i = \rho \times W_{ij} \times y_i + X_i \times \beta + \varepsilon_i$$

The Spatial Doblin Model(SDM) further examines the spatial spillover effect of explanatory variables on the explained variables. In other words, with the spatial matrix of explanatory variables being added to the formula, the explanatory variable coefficients and spatial explanatory variable coefficients are examined in terms of the direct and spatial effects of the influencing effects.

$$y_{it} = \rho \times W_{ij} \times y_{it} + X_{it} \times \beta + \theta \times X_{it} \times W_{ij} + \mu_i + e_i + \varepsilon_{it}$$

4.2 Data Sources

In this paper, China provincial panel data from 2000 to 2021 is used to examine the influencing factors of the spatial distribution of China's urban real estate development investment, including a total of 31 provinces and cities, and a total of 682 observation samples.

4.3 Variable Setting

In this study, the dependent variable is investment in real estate development, and the natural logarithm of the investment amount in real estate development is selected. The measurement methods of other independent variables are also shown in the table 1.

Table 1: Variable Settings

Nature	Name	Variable Meaning	Abbreviation
Dependent Variable	Real Estate Development Investment	Natural logarithm of real estate development investment amount	REI
Independent Variable	Population Urbanization	The ratio of urban population to the total population of the region	URBAN
	Industrial Structure	The proportion of the tertiary industry to GDP (%)	IND
	Economic Development	Natural logarithm of GDP per capita	PGDP
	House Price Level	The natural logarithm of the sales price per square meter of commercial housing in the region	HP
	Investment In Transport Infrastructure	The natural logarithm of total passenger traffic in transport infrastructure	INFRA
	Foreign Direct Investment	The proportion of regional foreign direct investment in regional GDP	FDI

5. Empirical Research

5.1 Descriptive Statistical Analysis

The results of the descriptive statistical analysis are presented in the table below. It can be seen that the mean value of real estate development investment (REI) is 6.626, the standard deviation is 1.654, the median is 6.918, the maximum value is 9.758, and the minimum value is -0.020, which shows that there is good continuity in all real estate development investments. In the following research, the econometric model will be adopted to investigate the influencing factors of the spatial distribution of China's urban real estate development investment. Besides, the correlation coefficient analysis also shows good results, as the correlation coefficient of each independent variable is below 0.7 [9]. (See Table 2, Table 3)

Table 2: Descriptive statistical analysis

	count	mean	sd	min	p50	max
REI	651	6.626	1.654	-0.020	6.918	9.758
urban	527	54.440	14.600	20.714	53.396	89.608
FDI	651	42.179	122.136	3.973	20.838	2958.883
INFRA	682	10.600	1.213	4.554	10.831	13.261
IND	682	46.144	9.108	29.645	44.503	83.732
PGDP	682	10.171	0.867	7.923	10.328	12.123
HP	651	8.290	0.715	6.855	8.344	10.536

Table 3: Correlation coefficient analysis table

(1)		REI	urban	FDI	INFRA	IND	PGDP	HP
REI		1.000						
urban		0.581*** (0.000)	1.000					
FDI		0.065* (0.098)	0.192*** (0.000)	1.000				
INFRA		0.595*** (0.000)	0.006 (0.885)	-0.075* (0.055)	1.000			
IND		0.206*** (0.000)	0.594*** (0.000)	0.171*** (0.000)	-0.337*** (0.000)	1.000		
PGDP		0.800*** (0.000)	0.615*** (0.000)	0.133*** (0.001)	0.072* (0.061)	0.568*** (0.000)	1.000	
HP		0.736*** (0.000)	0.599*** (0.000)	0.202*** (0.000)	0.068* (0.082)	0.666*** (0.000)	0.444*** (0.000)	1.000

p-values in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.2 Analysis of Empirical Results

5.2.1 Moran's Index Test

Before conducting spatial econometric modeling, the spatial correlation between the amount of real estate development investment and each independent variable in the sample has to be tested firstly. This test tool is usually Moran's I index. Here, this paper employs the Global Moran's I to test whether each variable is spatially correlated. The measurement results of the index show that the significance level of the Global Moran's I index can pass the 5% or 1% level, and the estimates of I are all greater than zero, which indicates that each variable is spatially positively

correlated.(See Table 4)

Table 4: Global Moran's I Index

Variables	I	E(I)	sd(I)	z	p-value*
REI	0.394	-0.033	0.116	3.678	0.000
urban	0.367	-0.033	0.117	3.414	0.000
FDI	0.394	-0.033	0.116	3.678	0.000
INFRA	0.023	-0.033	0.020	2.776	0.003
IND	0.203	-0.033	0.115	2.053	0.020
PGDP	0.211	-0.033	0.101	2.427	0.008
HP	0.362	-0.033	0.118	3.365	0.000

5.2.3 Test Results of the Spatial Dubin Model

Table 5: Analysis Results of the Spatial Dubin Model

	(1) REI	(2) REI	(3) REI	(4) REI	(5) REI	(6) REI
Main						
urban	0.033*** (0.01)	0.027*** (0.01)	0.053*** (0.01)	0.053*** (0.01)	0.053*** (0.01)	0.053*** (0.01)
FDI	-0.000* (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.000 (0.00)	-0.000** (0.00)	
INFRA	-0.064* (0.03)	-0.048 (0.03)	0.007 (0.04)	0.007 (0.04)		
IND	-0.002 (0.00)	-0.001 (0.00)	-0.006 (0.00)			
PGDP	0.717*** (0.17)	0.935*** (0.17)				
HP	0.649*** (0.12)					
Wx						
urban	-0.052*** (0.01)	-0.050*** (0.01)	0.005 (0.01)	0.004 (0.01)	-0.009 (0.01)	-0.009 (0.01)
FDI	0.000 (0.00)	0.001 (0.00)	0.000 (0.00)	0.000 (0.00)	-0.000 (0.00)	
INFRA	0.012 (0.05)	0.006 (0.05)	0.162*** (0.05)	0.169*** (0.05)		
IND	-0.014* (0.01)	-0.012* (0.01)	0.004 (0.01)			
PGDP	0.562** (0.23)	0.414* (0.21)				
HP	-0.609*** (0.18)					
Spatial						
rho	0.333*** (0.05)	0.313*** (0.05)	0.579*** (0.04)	0.576*** (0.04)	0.648*** (0.04)	0.647*** (0.03)
Variance						
sigma2_e	0.050*** (0.00)	0.053*** (0.00)	0.062*** (0.00)	0.062*** (0.00)	0.063*** (0.00)	0.063*** (0.00)
R ²	0.397	0.425	0.479	0.468	0.431	0.428
AIC	-11.783	7.799	111.367	105.220	116.138	112.537
BIC	97.588	100.343	187.085	164.112	158.204	137.777
N	496	496	496	496	496	496

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

It can be seen from the estimation results of the main effect that the coefficient of urban is

significantly positive in all models. In Model (1), the coefficient of urban is 0.033, which passes the 1% significance level, and indicates that urbanization development will significantly boost the scale of investment in urban real estate development in China. The coefficient of PGDP is also significantly positive in several models. In Model (1), the coefficient is 0.717, passing the 1% significance level, which indicates that the scale of urban real estate investment in economically developed areas is much higher. The coefficient of HP is also significantly positive, with a coefficient of 0.649, passing the 1% significance level, indicating that cities with high housing prices attract more real estate investment. It is worth noting that in the analysis of spatial spillover effects, the coefficient of rho in Model (1) is 0.333, which passes the 1% significance level, indicating that there is a significant spatial aggregation phenomenon in real estate investment [10]. The coefficient of Wx-urban in Model (1) is -0.052, passing the 1% significance level, which may indicate that urbanization development could hinder the spatial aggregation of urban real estate investment. The coefficient of Wx-IND in Model (1) is -0.014, passing the 10% significance level, which shows that areas with modern industrial structures would also be unfavorable for the spatial aggregation of real estate investment. The coefficient of Wx-PGDP is 0.717, passing the 1% significance level, which indicates that the level of economic development is conducive to the spatial aggregation of real estate investment. (See Table 5)

6. Conclusions and Recommendations

6.1 Research Conclusions

In this study, through theoretical analysis, the theory of influencing factors of the spatial distribution of real estate development investment in China is concluded, and five research hypotheses are proposed respectively. Based on the test SDM, there are five findings concluded as follows. First, it is obvious that there is a spatial aggregation phenomenon in urban real estate investment in China, which is due to the stronger synergistic effect of the real estate development in adjacent areas, and can drive the synergistic growth of urban properties and shape regional characteristics through residential and commercial housing. Second, urbanization is not conducive to the spatial aggregation of real estate development investment in Chinese cities, which indicates that urbanization and real estate investment have a complementary relationship, and that cities have not yet established a cooperative mechanism for joint urbanization, making it more likely that urbanized areas will siphon off real estate development investment funds from neighboring cities. (3) The industrial structure is not conducive to the spatial agglomeration of real estate development investment in China's cities, which probably is because that the developed industrial structure attracts more demand for housing and office space. It is more likely for the developed industrial with better division of functional labor to absorb the real estate development funds from other regions. Fourth, the increase in GDP per capita is conducive to the spatial aggregation of urban real estate development investment in China, because of the positive spatial spillover effect from the more economically developed regions on the adjacent areas, which promotes the spatial aggregation of real estate development and investment. Fifth, the level of housing prices is not conducive to the spatial aggregation of real estate development and investment. It may be due to the obvious competitive effect of regional housing prices. Excessive housing price growth is easier to absorb greater real estate development investment from surrounding cities, resulting in a polarization of spatial distribution.

6.2 Research Recommendations

First of all, the optimization of the spatial layout of urban real estate development in China needs to consider its spatial spillover effect. Therefore, it is necessary to build a regional collaborative investment mechanism, coordinate the synergistic growth of real estate development investment in various cities through top-level policy design, and perform the linkage effect of developed regions driving backward regions.

Secondly, the spatial layout planning of China's real estate development and investment needs to

pay attention to the urbanization gap, because the large urbanization gap may lead to the Matthew effect in real estate development and investment. It is also necessary to strengthen the urbanization synergy construction mechanism, and consider establishing convenient transportation network in each city, and simultaneously promote the balanced construction of urbanization.

Furthermore, the disparity of urban industrial structure may also cause the spatial imbalance of urban real estate development investment in China. It is necessary to allow every city to locate its industrial advantage layout function, so that new industries can get balanced development in every city, avoid the developed industries in a city to be too prominent, bring into play the characteristics of urban economic functions, and let the advantageous industries in urban clusters form complementary effects.

Finally, it is necessary to control the issue of over-expansion in real estate development and investment, and regulate the speculative behavior of investment entities. The government can make property market policies according to the city's population and its overall carrying capacity to avoid attracting excessive high-end property projects in developed cities and to restrain the rapid growth of urban housing prices. Additionally, the government can consider controlling the scale of real estate development investment according to the size of the city and introduce some livelihood real estate investment projects to protect the basic and immediate housing needs of the residents and limit the rapid growth of the average house price. Currently, with the issue of high real estate inventory in some cities, local governments can further transform surplus commercial housing into subsidized housing or low-cost commercial housing, which is effective in solving the inventory and improving the supply structure.

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