Research on the Relative Importance of Stakeholders' Behaviors to Residential Land Value Increment Based on Nested-Shapley Value Decomposition

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Abstract: This paper took the central government, local government, developers, home buyers and financial institutions as the research objects, and used the regression analysis and the dominance analysis method based on Nested-Shapley value decomposition to study the influence of the stakeholders' behaviors on the residential land value increment and the relative importance of the stakeholders' behaviors. The results indicated that: First, in the same region, the relative importance of the behaviors of different stakeholder to the residential land value increment is quite different; Second, in different regions, the relative importance of the behaviors of the same stakeholder to the residential land value increment are also different; Third, among the stakeholders' behaviors, the influence of developers' land purchase behaviors and construction behaviors on the residential land value increment is significant, stable and relatively important; Fourth, the difference of land value natural increment caused by regional inherent factors is more significant. The difference is the largest in west cities, followed by central cities, and smallest in the east cities.

1. Introduction

In the real estate primary and secondary market, there are many stakeholders, their behaviors not only affects the range of land incremental value, but also affects the distribution pattern of land incremental value[1]. Therefore, it is of great significance to further reveal the mechanism of land value increment and reasonably distribute the land incremental value by studying the impact of the various stakeholders' behaviors on land incremental value and the relative importance of their behaviors in the multi-level real estate market.

According to the literature in recent years, the related researches on the influencing factors of land value increment can be divided into two categories. The first kind of scholars believed that land price is affected by micro and macro factors. At the micro level, existing researches mainly explored the influencing factors of residential land price from three aspects: land attribute, location factor and neighborhood attribute[2, 3]. At the macro level, existing researches mainly analyzed the influencing factors of residential land price from three aspects: supply and demand, credit and residents' attributes[4, 5]. Although the above researches can explain the reasons of land value increment and compare the land value increment range in different regions, but they can not provide policy reference for the distribution of land incremental value. The second kind of researches focused on the stakeholders' behaviors in the real estate market, focusing on the impact of the stakeholders' behaviors in the real estate market on land price[6-9]. Thus, they have a certain reference value for the formulation of land incremental value distribution scheme.

Through the analysis of the above literatures, the research content of this paper can be further expanded: First, from the perspective of research, this paper was no longer limited to a certain market, but focused on the impact of the stakeholders' behaviors on residential land in the process of the development of the primary market to the secondary market; Second, from the analysis methods of research, this paper used regression analysis to study the impact of stakeholders' behaviors on

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residential land value incremental value, and used dominance analysis to compare the relative importance of each stakeholder's behaviors.

2. Sample and Data

2.1. Dependent Variable

Due to land value increment is sustainable and dynamic, the land value incremental rate can reflect the change of land value. Therefore, this paper calculated the average residential land value increment rate ($LIV_{i,t}$) by referring to the calculation method of land incremental value in land-value increment tax, which is used to measure the degree of residential land value increment in the process of real estate primary market developing into real estate secondary market during the housing construction period. The calculation method is shown in formula (1):

$$\begin{aligned} LIV_{i,t} = & \frac{1}{Land\text{-}transferring\ fees_{i,t-2}} \times (Housing\ price_{i,t} \times Plot\ ratio_{i,t} - Taxes_{i,t} \\ & - Development\ costs_{i,t} - Land\text{-}transferring\ fees_{i,t-2} - Loan\ interest_{i,t} \\ & - Other\ development\ costs_{i,t} - Additional\ deduction_{i,t}) \end{aligned} \tag{1}$$

i represents each city, t represents each year and $2008 \le t \le 2018$. Referring to the research of Lin Ruirui et al., this paper took the housing construction period as 2 years, the tax as 6% of the housing sale prices, and the average loan interest of the developer as 6% of the sum of the land-transferring fees and the real estate development costs[10]. According to the *Detailed Rules for the Implementation of the Interim Regulations on Land Value Increment Tax*, this paper took other real estate development costs as 5% of the sum of land-transferring fees and real estate development costs. According to the *Tax Law*, this paper took the additional deduction as 20% of the sum of the land-transferring fees and the real estate development costs. In this paper, the real estate development costs is expressed as housing completion value[11]. Therefore, the residential land value increment rate ($LIV_{i,t}$) can be expressed as:

$$\begin{aligned} LIV_{i,t} = & \frac{1}{Land\text{-}transferring\ fees_{i,t-2}} \times [Housing\ prices_{i,t} \times Plot\ ratio_{i,t} \times (1-6\%) \\ & - (Housing\ completion\ value_{i,t} \times Plot\ ratio_{i,t} + Land\text{-}transferring\ fees_{i,t-2}) \\ & \times (1+5\%+20\%+6\%)] \end{aligned} \tag{2}$$

2.2. Independent Variables

Referred to the existing research[4, 8], the identification and measurement methods of stakeholders and their behaviors in the real estate primary and secondary markets were shown in Table 1:

Table 1 The behaviors and measurement indexes of stakeholders.

Subject	Behavior	Measurement index	Calculation method
The central government	Formulate fiscal and taxation policies and real estate related policies	Dummy variables of construction cycle (γ_t)	*Time dummy*
The local governments	Supply construction land	Growth rate of residential land launch area ($LS_{i,t}$)	$\frac{Residential\ land\ launch\ area_{i,t}}{Residential\ land\ launch\ area_{i,t-2}} - 1$
	Rely on Land Finance	Difference value of local government's dependence on land finance ($LGI_{i,t}$)	$\frac{\frac{Land\ transfer\ fees_{i,t}}{Local\ government\ budget\ revenue_{i,t}}}{\frac{Land\ transfer\ fees_{i,t-2}}{Local\ government\ budget\ revenue_{i,t-2}}} - 1$
	Adjuste plot ratio	Difference value of plot ratio ($FAR_{i,t}$)	$\frac{Land\ price\ per\ land\ area_{i,t}}{Land\ price\ per\ floor\ area_{i,t}} - \frac{Land\ price\ per\ land\ area_{i,t-2}}{Land\ price\ per\ floor\ area_{i,t-2}}$

Developers	Obtain the right to use land for residential construction	growth rate of land price per land area ($LP_{i,t}$)	$\frac{land\ price\ per\ land\ area_{i,t}}{land\ price\ per\ land\ area_{i,t-2}}-1$
	Investment and construction	Growth rate of housing completion value ($HCV_{i,t}$)	$\frac{Housing\ completion\ value_{i,t}}{Housing\ completion\ value_{i,t-2}}-1$
	Pricing house and selling house	Growth rate of housing price ($HP_{i,t}$)	$\frac{Housing\ price_{i,t}}{Housing\ price_{i,t-2}}-1$
	Hoarding land	Difference value of idle rate of land($pLH_{i,t}$)	$\frac{Developed\ residential\ area_{i,t}}{Land\ transaction\ area_{i,t}\times Plot\ ratio_{i,t}}-\frac{Developed\ residential\ area_{i,t-2}}{Land\ transaction\ area_{i,t-2}\times Plot\ ratio_{i,t-2}}$
Home buyers	Rigid demand	Growth rate of home buyers' rigid demand ($HRD_{i,t}$)	$\frac{permanent\ resident\ population_{i,t}-registered\ population_{i,t}}{permanent\ resident\ population_{i,t-2}-registered\ population_{i,t-2}}-1$
	Investment demand	Difference value of home buyers' investment demand ($HPIR_{i,t}$)	$\frac{housing\ price\ to\ income\ ratio_{i,t}}{housing\ price\ to\ income\ ratio_{i,t-2}}-1$
Financial institutions	Credit aid	Difference value of credit support ($TL_{i,t}$)	$\frac{financial\ institutions\ loan_{i,t}}{Urban\ GDP_{i,t}}-\frac{financial\ institutions\ loan_{i,t-2}}{Urban\ GDP_{i,t-2}}$
Other macro variables	Measure the economic development level of each city	Growth rate of urban GDP per capita ($GDP_{i,t}$)	$\frac{Urban\ GDP\ per\ capita_{i,t}}{Urban\ GDP\ per\ capita_{i,t-2}}-1$
	Measure the living standards of urban residents	Growth rate of urban residents per capita disposable income ($PCDI_{i,t}$)	$\frac{Urban\ residents\ per\ capita\ disposable\ income_{i,t}}{Urban\ residents\ per\ capita\ disposable\ income_{i,t-2}}-1$

2.3. Data

This paper selected the panel data of 35 large and medium-sized cities in China from 2006 to 2018 as the research sample. The data came from the *China Real Estate Statistical Yearbook*, *China City Statistical Yearbook*, *China Statistical Yearbook*, municipal statistical yearbooks, public information of the People's Bank of China, CREIS database, and Shanghai E-House Real Estate Research Institute.

3. Methods

3.1. Regression Analysis

Firstly, this paper constructed a regression analysis model. Due to the F-likelihood ratio test rejected the null hypothesis that mixed models (OLS) should be used; Hausman test rejected the null hypothesis that random effects model (RE) should be used, so this paper established a fixed effects model (FE) as formula (3).

$$\begin{aligned} LIV_{i,t} &= \beta_0 + \beta_1 GDP_{i,t} + \beta_2 PCDI_{i,t} + \beta_3 LS_{i,t} + \beta_4 FAR_{i,t} + \beta_5 LGI_{i,t} + \beta_6 LP_{i,t} + \beta_7 pLH_{i,t} \\ &+ \beta_8 HP_{i,t} + \beta_9 HCV_{i,t} + \beta_{10} HRD_{i,t} + \beta_{11} HPIR_{i,t} + \beta_{12} TL_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t} \end{aligned} \tag{3}$$

i represents each city, t represents each year and $2008 \le t \le 2018$, β_0 represents a constant term, $\beta_1,\beta_2,\ldots,\beta_{12}$ represent estimated coefficients, μ_i represents the city fixed effects, γ_t represents time fixed effects, $\varepsilon_{i,t}$ represents the residual.

The variance inflation factor (VIF) values of each variable in the model were all less than 10, the average value was 2.13, and the maximum value was 3.48. Therefore, the influence of multicollinearity on the model estimation could be excluded. In addition, this paper conducted intra-group autocorrelation test, inter-group heteroscedasticity test and cross-section correlation test on the model, and the results showed that there was no intra-group autocorrelation problem in the model, but there was inter-group heteroscedasticity problem and possibly cross-section correlation problem.

Therefore, the Driscoll-Kraay standard error correction fixed effect model (FE/SCC) was used to estimate the model[12].

3.2. Dominance Analysis

Tonidandel et al. believed that regression analysis is suitable for solving problems where dependent variables change based on changes of independent variables when other explanatory variables remain unchanged, while dominance analysis can provide a more comprehensive understanding of the effects of specific explanatory variables relative to other variables[13]. The basic idea of dominance analysis is to analyze the relative importance of independent variables by comparing and explaining the contribution of all possible subset models of variables to the determinant coefficient R^2 of regression model[14]. Therefore, this paper used the dominance analysis to study the relative importance of each stakeholder's behaviors on the residential land value increment.

Trannoy and Sastre believed that compare with the dominance analysis based on Shapley value decomposition, the dominance analysis based on Nested-Shapley value decomposition has the characteristics of convergence and consistency, and compare with the dominance analysis based on Owen decomposition, the dominance analysis based on Nested-Shapley value decomposition only considers the decomposition of the same level of contribution sources, and the decomposition results have good economic explanation[15]. Therefore this paper adopted the Nested-Shapley value decomposition to dominance analysis.

According to the two-stage decomposition idea proposed by Isareli[16], this paper grouped the elements in the variable set $K=\{x_1,x_2,\ldots,x_k\}$ to get set P_K, and assumed $P_K = \{S_1,\ldots,S_l,\ldots,S_m\}$, so that for S_h , $S_l \in P_K$, there are $S_h \cap S_l = \varnothing$ and $\cup_{h=1}^{m} S_h = K$.

The first−stage: this paper used the dominance analysis based on Shapley value decomposition to decompose the contribution of residential land value increment to each stakeholder, studied the "inter-group contribution" of stakeholders, the calculation method was shown in formula (4).

$$NSh_{S_l} = \sum_{\substack{N \subseteq P_K \\ S_l \in N}} \frac{(n-1)!(m-n)!}{m!}\left[R^2(N) - R^2\left(N/\{S_l\}\right)\right] \tag{4}$$

N is a subset of P_K, $N \subseteq P_K$; n is the number of elements in the set N; m is the number of elements in P_K; S_l is the element of P_K and also the element of set N, $S_l \in P_K$, $S_l \in N$; $N/\{S_l\}$ represents the set formed by removing $\{S_l\}$ from the set N; $R^2(K)$ is a shorthand of $R^2\left(y = a + \sum_{j=1}^{k} b_j x_j + e\right)$, it means the goodness of fit of regression formula $y = a + \sum_{j=1}^{k} b_j x_j + e$.

The second−stage: this paper used the dominance analysis based on Nested-Shapley value decomposition to decompose the contribution of each stakeholder to the residential land value incremental into their corresponding behaviors, studied the "intra-group contribution" of each stakeholder. The contribution of x_j obtained by decomposition was shown in formula (5):

$$NSh_{x_j} = \sum_{\substack{S \subseteq S_l \\ x_j \in S}} \frac{(s-1)!(s_l - s)!}{s_l!}\left[R^2(S) - R^2\left(S/\{x_j\}\right)\right] + \frac{1}{s_l}\left[NSh_{S_l} - R^2(S_l)\right] \tag{5}$$

S is a subset of set S_l, x_j is a element of set S, s is the number of elements in the set S, s_l is the number of elements in the set S_l, $S/\{x_j\}$ represents the set formed by removing $\{x_j\}$ from the set S.

4. Results and Discussion

4.1. Regression Analysis Results

The results of regression analysis were shown in table 2. In table 2, model 1, 2 and 3 represented the regression results of OLS model, RE model and FE/SCC model, respectively. In addition, in order to reduced the influence of regional inherent factors, according to regional characteristics, this paper

divided 35 cities into eastern, central and western, and used FE/SCC model for regression analysis. The regression results were shown in Model 4, 5 and 6.

Table 2 Regression analysis results.

	All samples			Eastern samples	Central samples	Western samples
	Model 1 OLS	Model 2 RE	Model 3 FE/SCC	Model 4 FE/SCC	Model 5 FE/SCC	Model 6 FE/SCC
GDP	0.2028	0.4390	0.4390*	0.4126	0.0351	-0.2387
	(0.3103)	(0.3106)	(0.2197)	(0.2293)	(0.5083)	(0.8018)
PCDI	0.8907	0.7636	0.7636	0.0739	0.9355	1.2867
	(0.9640)	(1.1041)	(0.6997)	(1.0008)	(1.6438)	(1.4308)
LS	-0.0194	-0.0904**	-0.0904*	-0.2189**	0.0243	-0.0818
	(0.0625)	(0.0453)	(0.0408)	(0.0778)	(0.1087)	(0.1317)
FAR	-0.4316***	-0.4810***	-0.4810***	-0.5960***	-0.4305*	-0.2994
	(0.1477)	(0.0981)	(0.1033)	(0.0819)	(0.2158)	(0.2179)
LGI	0.0643	0.2461	0.2461	0.2416*	0.0157	0.3966
	(0.2270)	(0.1609)	(0.1697)	(0.1102)	(0.1872)	(0.8334)
LP	0.4931***	0.4543***	0.4543***	0.5410***	0.6892***	0.5041
	(0.0902)	(0.1437)	(0.1058)	(0.0810)	(0.1123)	(0.3240)
HP	1.2255**	2.0524***	2.0524***	1.0115***	3.0880***	3.0762**
	(0.5377)	(0.4117)	(0.2959)	(0.1454)	(0.6677)	(0.9808)
HCV	-1.7917***	-1.8580***	-1.8580***	-1.3322***	-1.7443***	-2.2758***
	(0.3070)	(0.2371)	(0.1964)	(0.2107)	(0.3979)	(0.6767)
pLH	-0.0128	0.0168	0.0168	0.0414*	-0.0585	0.0745***
	(0.0317)	(0.0116)	(0.0303)	(0.0194)	(0.1338)	(0.0153)
HRD	0.0467	0.0374	0.0374*	0.3194	0.0782*	-0.0502
	(0.0399)	(0.0341)	(0.0186)	(0.3120)	(0.0359)	(0.0457)
HPIR	-0.0214	-0.0491	-0.0491***	-0.0678***	-0.0343	0.2563**
	(0.0463)	(0.0595)	(0.0091)	(0.0148)	(0.1025)	(0.1140)
TL	0.2621	0.3881	0.3881**	0.3587	0.2349	0.2774
	(0.2924)	(0.3323)	(0.1424)	(0.2610)	(0.2355)	(0.7229)
Constant	0.2379	-0.1500	-0.1500	0.4577**	-0.5408	-0.3981
	(0.2354)	(0.4092)	(0.2430)	(0.2009)	(0.8009)	(0.7162)
City fixed effects?	No	Yes	Yes	Yes	Yes	Yes
Time fixed effects?	No	Yes	Yes	Yes	Yes	Yes
N	385	385	385	176	99	110
*R*2	0.205	—	0.560	0.604	0.815	0.574

Note: Robust standard errors in parentheses, ***p<0.01, **p<0.05, *p<0.1.

It cound be seen from Model 3 that: From all samples, the increase of average land price ($LP_{i,t}$), housing price ($HP_{i,t}$), housing rigid demand ($HRD_{i,t}$), credit support ($TL_{i,t}$) and per capita GDP growth rate ($GDP_{i,t}$) promote the increase of comprehensive value of residential land. However, the increase of residential land launch area ($LS_{i,t}$), plot ratio ($FAR_{i,t}$), housing completion value ($HCV_{i,t}$) and housing investment demand ($HPIR_{i,t}$) restrain the residential land value increment.

It could be seen from the estimation results of Model 4, 5 and 6 that: in the behaviors of local government, the increase of residential land launch area ($LS_{i,t}$) only has a inhibiting effect on the residential land value increment in eastern cities; the increase of plot ratio ($FAR_{i,t}$) only restrains the residential land value increment in the eastern and central cities; The increase of local government's dependence on land finance ($LGI_{i,t}$) only promotes the residential land value increment in eastern cities. In the behaviors of developers, the increase of land price ($LP_{i,t}$) only promotes the residential land value increment in the eastern and central cities; The increase of housing price ($HP_{i,t}$) has a promoting effect on the residential land value increment in the eastern, central and western cities; The increase of housing completion value ($HCV_{i,t}$) restrains the residential land value increment in the eastern and western cities; The increase of land hoarding ($pLH_{i,t}$) only promotes the residential land value increment in eastern and western cities. In the behaviors of home buyers, the increase of housing rigid demand ($HRD_{i,t}$) only promotes the residential land value increment in central cities; The

increase of housing investment demand ($HPIR_{i,t}$) restrains the residential land value increment in eastern cities and promote the residential land value increment in western cities.

4.2. Dominance Analysis Results

This paper decomposed all stakeholders' behaviors[17]. Since the growth rate of per capita GDP ($GDP_{i,t}$) and the growth rate of per capita disposable income ($PCDI_{i,t}$) are closely related to the policies issued by local governments, therefore this paper attributed the contribution of these factors to local governments.

Table 3 Dominance analysis results based on Nested-Shapley value decomposition Unit:%.

Stakeholder	Behavior	Contribution (All samples)		Contribution (Eastern samples)		Coutribution (Central samples)		Contribution (Western samples)	
		Stage 1	Stage 2	Stage 1	Stage2	Stage 1	Stage 2	Stage 1	Stage 2
The central government	Time fixed effects	5.97	5.97	8.92	8.92	8.20	8.20	11.08	11.08
The local governments	GDP	5.79	-0.23	20.13	3.09	7.87	-0.34	6.93	2.02
	PCDI		-0.26		0.94		-1.15		0.02
	LS		0.67		13.46		3.38		-0.61
	FAR		-0.19		-1.18		-0.61		-1.16
	LGI		5.79		3.81		6.60		6.66
Developers	LP	28.12	13.39	44.29	28.51	35.57	6.34	18.77	8.76
	HP		3.15		1.10		11.46		2.59
	HCV		12.03		12.46		16.38		9.07
	pLH		-0.45		2.22		1.39		-1.65
Home buyers	HRD	1.03	-0.31	2.00	0.30	5.98	1.16	2.80	-0.13
	HPIR		1.34		1.70		4.82		2.93
Financial institutions	TL	1.07	1.07	1.95	1.95	0.32	0.32	0.74	0.74
Regional inherent factor	City fixed effects	58.02	58.02	22.71	22.71	42.06	42.06	59.69	59.69

4.2.1. First-stage Decomposition Results

From all samples, the contribution rate of regional inherent factors to the residential land value increment is the largest, which is 58.02%, indicating that the residential land value natural increment is quite different among cities in China. Excluding the influence of inherent factors, the contribution rate of developers' behaviors is 28.12%; The contribution rate of central government behaviors is 5.97%; The contribution rate of local government behaviors is 5.79%; The contribution rates of financial institutions' and homebuyers' behaviors were 1.07% and 1.03%. The results showed that the behaviors of developers are relatively important to the residential land value increment, followed by the behaviors of central government and local governments, while the behaviors of financial institutions and buyers are relatively unimportant.

From the decomposition results of regional samples, it could be found that: first, the contribution rate of local inherent factor to the residential land value increment increased from the east to the west; Second, the central government's behaviors have the largest contribution to the residential land value increment in the western cities, followed by the eastern cities, and the weakest contribution to the central cities; Third, the contribution rates of local governments' behaviors and developers' behaviors to the residential land value increment decrease from east to west; Fourth, the contribution rate of the behaviors of home buyers and financial institutions to the residential land value increment in the eastern, central and western rank at the bottom.

4.2.2. Second-stage Decomposition Results

From all samples, it could be seen that among all the stakeholders' behaviors, the developers' land purchase behavior ($LP_{i,t}$) has the greatest contribution to the residential land value increment, which is 13.39%. The contribution rates of developers' construction behavior ($HCV_{i,t}$) and local government land finance dependence behavior ($LGI_{i,t}$) are 12.03% and 5.79% respectively. However, the contribution rate of other stakeholders' behaviors are limited.

It could be seen from the decomposition results of samples in different regions that: First, in the eastern cities, the contribution rate of developers' land purchase behavior ($LP_{i,t}$) to the residential land value increment is the largest, which is 28.51%. The contribution rates of the local governments' residential land area launching behavior ($LS_{i,t}$) and the developers' construction behavior are also large ($HCV_{i,t}$) , which were 13.46% and 12.46%, respectively. It is worth noting that the contribution rate of local governments' plot ratio regulation behavior ($FAR_{i,t}$) is -1.18%, indicating that the regulation of plot ratio has a weak inhibiting effect on the change of residential land value increment in eastern cities. The contribution of other behaviors are limited. Second, in central cities, developers' construction behavior ($HCV_{i,t}$) has the largest contribution to the residential land value increment, which is 16.38%. The contribution rates of developers' pricing house behavior ($HP_{i,t}$), local governments' land finance dependence behavior ($LGI_{i,t}$) and developers' land purchase behavior ($LP_{i,t}$) are also large, which are 11.46%, 6.60% and 6.34%, respectively. The contribution rate of residents' living standard ($PCDI_{i,t}$) is -1.15%, which has a weak inhibitory effect on the change of residential land value increment in central cities. The contribution of other beaviors are limited. Third, in western cities, the contribution rate of developers' construction behavior ($HCV_{i,t}$) to the residential land value increment is the largest, which is 9.07%. The contribution rate of developers' land purchase behavior ($LP_{i,t}$) and local goverments' land finance dependence behavior ($LGI_{i,t}$) are also large, which are 8.76% and 6.66%, respectively. However, the contribution rates of local goverments' plot ratio regulation behavior ($FAR_{i,t}$) and developers' land hoarding behavior (PLHI,t) are -1.16% and -1.65%, respectively, which have a weak inhibiting effect on the residential land value increment in western cities. The contribution rate of other behaviors are limited

5. Conclusion

This paper used regression analysis and dominance analysis based on nested Shapely decomposition to study the influence of the stakeholders' behaviors on the residential land value increment and the relative importance of the stakeholders' behaviors in the real estate primary and secondary markets, and the conclusions were drawn as follows: First, in the same region, the relative importance of the behaviors of different stakeholder to the residential land value increment is quite different. In general, the behaviors of developers are relatively important for the residential land value increment, followed by the behaviors of central and local governments, and the behaviors of home buyers and financial institutions are relatively unimportant; Second, in different regions, the relative importance of the behaviors of the same stakeholder to the residential land value increment are also different. The relative importance of the central government's behaviors to the western residential land value increment is greater than that to the eastern and central cities; The relative importance of the behaviors of local governments and developers to the eastern residential land value increment is greater than that to the central and western cities; The relative importance of the behaviors of home buyers to the central residential land value increment is greater than that to the eastern and western cities; The relative importance of the behaviors of financial institutions to the eastern residential land value increment are greater than that to the central and western cities; Third, among the stakeholders' behaviors, the influence of developers' land purchase behaviors and construction behaviors on the residential land value increment is significant, stable and relatively important; Fourth, the difference of land value natural increment caused by regional inherent factors is more significant. The difference is the largest in west cities, followed by central cities, and smallest in the east cities.

Based on the above conclusions, this paper put forward the following policy recommendations: First, according to the specific characteristics of each city to formulate different policies. The governments should take into account the inherent factors among cities and adopt the policy of " implementing policies according to the characteristics of city" for cities with different resource endowments, industrial structures and economic development goals; Second, the regulation and control of the real estate market by the government departments should take into account the relative importance difference of each stakeholder's behaviors to the residential land value increment in different regions; Third, relevant departments need to strictly supervise the behaviors of developers and local governments. Governments need to do a good job in strict supervision and monitoring of

land transactions, to prevent abnormal changes in the residential land price and damage the interests of home buyers and other stakeholders.

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