An Analysis of the Factors that Affect Collective Construction Land Transfer Price: A Case Study of Yichang City

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Abstract The transfer of the rural collective construction land is increasingly accelerating, and the factors affecting transfer price are manifold. In this paper, the research area is Yichang, and we establish hedonic price model to explore and analyze the factors which affect the collective construction land transfer price. The simulation results show that in geographical factors, the higher degree of prosperity, road accessibility and soundness of infrastructure will result in higher collective construction land transfer price; in economic factors, the higher farmers' per capita net income and added value of the village's tertiary industry will lead to higher collective construction land transfer price; in ownership factors, the integrity of usufruct, disposition and possession has increasingly significant impact on collective construction land transfer price. In the process of establishing rural collective construction land circulation market, the government should gradually improve conditions of collective construction land; strengthen the construction of the rural economy, improve the economic attribute of the collective construction land; establish and improve China's rural collective construction land-related laws and regulations, make the rural collective construction land use rights clear, and give the whole rights of occupation, use, earning and disposition.

Key words Rural collective construction land, Transfer price, Hedonic price model

1 Introduction

With the development of new urbanization construction, establishing a unified urban-rural construction land market has become inevitable, and the land transfer will also accelerate. China's rural collective construction land is five times more than the urban state-owned construction land, and its transfer will be common. The collective construction land transfer price is the key factor in its circulation, and there are many factors that affect the collective construction land transfer price, so the comprehensive study of these influencing factors is of great significance to resolving construction land transfer issues, and promoting collective land use system reform. Yichang City is Hubei's second largest city following the provincial capital of Wuhan, and its urban development is accelerating with the construction of the Three Gorges Project. Currently, Yichang City is making great efforts to promote the construction of a modern mega-city, and create a good investment environment for development. The urban construction is gradually expanding, and the collective construction land transfer is accelerating. Therefore, with some regions in Yichang City as the study areas, this paper builds hedonic price model to study the factors affecting the collective construction land transfer price, and makes some recommendations for reasonable rural collective construction land transfer.

2 Methods

2.1 Fundamentals Hedonic price model is a model used for the analysis of relationship between heterogeneous commodity differences and commodity prices. The consumer theory developed by Lancaster (1966) and the supply and demand balance model of Rosen (1974) form the theoretical basis of hedonic price model. Hedonic price model assume that the price of a product reflects embodied characteristics valued by some implicit or shadow prices. Hedonic price regression models are estimated using secondary data on prices and attributes of different product or service alternatives. Suppose consumer preferences are similar to consumer income levels, the collective construction land price is the function of these attributes. The function is set as follows:

$$p = \alpha_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots \beta_n x_n \quad (1)$$

where p is collective construction land price; α is the constant term; $x_1 \cdots x_n$ are the collective construction land attributes; $\beta_1 \cdots \beta_n$ are the implicit prices of collective construction land attributes.

The previous land price assessment based on hedonic price model is mainly focused on urban land, and closely associated with hedonic price model of real estate. There are few studies on agricultural land and rural collective construction land price, and the factors affecting the collective construction land transfer price are very different from urban land, for example, the plot ratio, building density and greening rate having a great impact on urban land prices, seldom affect the collective construction land transfer price. Therefore, when establishing the model, we need to consider the characteristics and special properties of collective construction land to select influencing factors.

2.2 Model selection Based on the experience of domestic and foreign scholars on hedonic price model research, this paper uses the semi-logarithmic function (Equation 2) to establish the hedonic price model for researching regional rural collective construction land, uses SPSS17.0 for multiple regression analysis, and employs OLS to estimate unknown parameters and get regression equation

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model. By the statistical test of regression coefficient, the non-significant factors are excluded, to get the optimal model.

$$\ln P = a_0 + \sum a_i \ln X_i + \sum a_j X_j + \varepsilon \quad (2)$$

where P is the collective construction land transfer price; a_0, a_i, a_j are the coefficients to be estimated; X_i is the continuous characteristic variable; X_j is the dummy variable; ε is the error term.

2.3 Variable selection and quantification Based on literature, collective construction land characteristics and related rules and regulations, 13 variables are selected as the independent variables of model, which are divided into three categories (location characteristics; economic characteristics; ownership characteristics). The quantification of characteristic variables and the impact sign based on theoretical expectation can be shown in Table 1.

Table 1 Collective construction land characteristics and quantification

Characteristics category	Quantitative indicators	Variable explanation	Expected sign
Location characteristics	Degree of prosperity (X_1)	The linear distance between the village committee and the nearest township government, unit: km	–
	Road accessibility (X_2)	The highest score of road near the village committee (national highway, 6 points; expressway entrance, 5 points; provincial highway, 4 points; county road, 3 points; township road, 2 points; village road, 1 point)	+
	Traffic convenience (X_3)	The number of long-distance lines from the village to the urban area and other towns, 1 point for 1, 5 points for more than 5	+
	Soundness of infrastructure (X_4)	The village's infrastructure: water, electricity, road, communication and gas, 1 point each, maximum of 5 points	+
	Soundness of public facilities (X_5)	The village's public facilities: schools, hospitals (or clinic), grocery stores, cultural and entertainment centers, 1 point each, maximum of 4 points	+
Economic characteristics	Arable land area per capita (X_6)	The arable land area per capita in the village in 2011, unit: mu	–
	Rural per capita net income (X_7)	The three-year average rural per capita net income in the village during 2010 – 2012, unit: 10^4 yuan	+
	Added value of the village's primary industry (X_8)	The three-year average added value of primary industry in the township during 2010 – 2012, unit: 10^4 yuan/year	+
	Added value of the village's secondary industry (X_9)	The three-year average added value of secondary industry in the township during 2010 – 2012, unit: 10^4 yuan/year	+
	Added value of the village's tertiary industry (X_{10})	The three-year average added value of tertiary industry in the township during 2010 – 2012, unit: 10^4 yuan/year	+
Ownership characteristics	Possession (X_{11})	Whether the ownership affirmation can be registered, dummy variable, yes 1, no 0	+
	Usufruct (X_{12})	Whether it is transferred only by way of joint venture, yes 1, no 0	–
	Disposition (X_{13})	Whether it can be transferred again, dummy variable, yes 1, no 0	+

Table 2 Regression analysis of hedonic price model

Independent variables	Definition	Coefficient	T value
CONSTANT	Constant term	−298.973	−0.801
PROSPROUS	Degree of prosperity	−13.789***	−2.779
ROAD	Road accessibility	388.204**	2.197
INFRASTRUCTURE	Soundness of infrastructure	657.656***	3.473
FACILITY	Soundness of public facilities	9.031	0.635
PLOUGH	Arable land area per capita	7.932	0.032
NET INCOME	Rural per capita net income	124.861**	1.903
PRIMARY	Added value of the village's primary industry	70.182**	3.112
SECONDARY	Added value of the village's secondary industry	119.734**	1.756
SERVICE	Added value of the village's tertiary industry	123.795***	7.009
OCCUPY	Possession	289.097**	2.113
USE	Usufruct	90.639**	3.194
DISPOSITION	Disposition	139.012**	1.381

Note: * represents 10% significant level; ** represents 5% significant level; *** represents 1% significant level.

3 Empirical analysis

3.1 Data description This paper takes five regions (Xiaoting District, Yiling District, Zhijiang District, Yidu City, Dangyang City) in Yichang City as the study areas. The total sample size is

65, the actual sample size for model is 60, and the land transfer time span is 2012 and 2014. Data sources include questionnaire survey and online enquiry.

3.2 Regression results Using stepwise regression, 10 independent variables with statistical significance (10% significant level) are selected (Table 2), including degree of prosperity, road accessibility, soundness of infrastructure, rural per capita net income, added value of the village's primary industry, added value of the village's secondary industry, added value of village collective tertiary industry, possession, usufruct, and disposition. Then these 10 characteristic variables are put into the semi-logarithmic model for testing. From the regression results (Table 3), it can be found that F test value of regression equation is significant at the 0.01 level, and the adjusted R^2 is 0.8621, indicating that the fitting equation is highly significant, and the characteristic factors into the equation have a significant impact on collective construction land transfer price ln *P*. In terms of the *VIF* value of all characteristic variables, the minimum is 1.098 and maximum is 1.467, less than 10, indicating that the collinearity between variables is not serious. *DW* value is 1.872, and it can be judged that there is no autocorrelation in the model at the 0.01 significance level. In the White test, $Obs * R\text{-squared} = 26.011$, $P = 0.123 > 0.01$, so there is no heteroscedasticity in model at the 0.01 significance level.

Table 3 Regression results of semi-logarithmic hedonic price model

Explanatory variables	Regression coefficient		*t*	*Sig.*	Collinearity statistic	
	B	β			Tolerance	*VIF*
Constant term	7.652		4.967	0.009		
Degree of prosperity	-0.137	-0.623	-13.883	0.001	0.794	1.112
Road accessibility	0.109	0.411	5.195	0.011	0.789	1.467
Soundness of infrastructure	0.057	0.156	6.870	0.005	0.667	1.331
Rural per capita net income	0.073	0.199	3.621	0.017	0.781	1.132
Added value of the village's primary industry	-0.105	-0.321	-5.113	0.001	0.872	1.098
Added value of the village's secondary industry	-0.088	-0.213	-3.979	0.009	0.763	1.231
Added value of the village's tertiary industry	0.115	0.487	6.998	0.000	0.915	1.300
Possession	0.314	0.710	3.763	0.001	0.698	1.209
Usufruct	-0.101	-0.229	-2.004	0.007	0.851	1.187
Disposition	0.122	0.597	2.013	0.013	0.716	1.210

Note: Adjusted $R^2 = 0.8621$; $F = 82.42$ (significant at 1% level); $DW = 1.872$; $Obs * R\text{-squared} = 26.011$, $P = 0.123$.

3.3 Analysis of regression results

3.3.1 Qualitative analysis of influencing factors. Due to different units, the degree of influence of the factors affecting collective construction land transfer price can not be directly compared, but the standardized regression coefficient β is obtained after standardization of all variables, and it is comparable, so its absolute value is used for ordering of the degree of influence. The factors that affect collective construction land transfer price are divided into four categories. Classification criteria: first category $\beta \geqslant 0.50$; second category $\beta \geqslant 0.30$; third category $\beta < 0.10$. The ordering and classification results are shown in Table 4, and we can find that there are differences in the degree of influence of 10 factors having close relationship with collective construction land transfer price. The factor with the greatest influence on collective construction land transfer price is possession, and the factor with the minimal impact on transfer price is soundness of infrastructure. In location characteristics, the factor with the greatest influence on collective construction land transfer price is the village collective's degree of prosperity; in economic characteristics, the factor with the greatest influence on collective construction land transfer price is the added value of village collective tertiary industry; in ownership characteristics, possession has the greatest influence.

3.3.2 Quantitative analysis of the influencing factors. In the model, the sign of influencing factors α_i and α_j indicates the direction of action on collective construction land transfer price increase or decrease, and the value represents the price elasticity of influencing factors. (i) In terms of location factors, the characteristic coefficient α_1 shows that for each additional 1% of distance between village committee and township government, the collective construction land transfer price will decrease by 13.7%, indicating that attracted by urban economic center, it forms a trend of decreasing collective construction land transfer price with urban area as center. The characteristic coefficients α_2 and α_4 show that for each additional 1% of road accessibility and soundness of infrastructure, the collective construction land transfer price will increase by 10.9% and 5.7%, respectively, because the improvement of rural land conditions and farmers' living standards has increased the collective construction land transfer price. (ii) In terms of economic factors, the characteristic coefficients α_7 and α_{10} show that for each additional 1% of rural per capita net income and added value of the village's tertiary industry, the collective construction land transfer price will increase by 7.3% and 11.5%, respectively. The characteristic coefficients α_8 and α_9 show that for each additional 1% of added value of the village's primary industry and added value of the village's secondary industry, the collective construction land transfer price will decrease by 10.5% and 8.8%, respectively. Results show that the higher the income of farmers, the higher the collective construction land

transfer price, and the development of the rural collective tertiary industry is the core power for collective construction land transfer price increase. (iii) In terms of ownership factors, the collective construction land transfer price when the land use rights are confirmed and registered is 36.9% higher than the price when the land use rights are not confirmed and registered (i.e., $e^{0.314}-1$, the same below), and the collective construction land transfer price when the transfer is allowed again is 13% higher than the price when the transfer is not allowed again. The collective construction land transfer price when the land is transferred only by joint venture is 9.6% lower than the price when the land is transferred by other modes, and the measuring results show that the ownership integrity has a significant impact on the collective construction land transfer price.

Table 4 The degree of influence and classification of the factors affecting the collective construction land transfer price

Characteristics category	Characteristic variables	Absolute value of standardized regression coefficients	Ordering of degree of influence	Category ordering	Classification of degree of influence
Location characteristics	Degree of prosperity	0.623	2	1	1
	Road accessibility	0.411	5	2	2
	Soundness of infrastructure	0.156	10	3	3
Economic characteristics	Rural per capita net income	0.199	9	4	3
	Added value of the village's primary industry	0.321	6	2	2
	Added value of the village's secondary industry	0.213	8	3	3
	Added value of the village's tertiary industry	0.487	4	1	2
Ownership characteristics	Possession	0.710	1	1	1
	Usufruct	0.229	7	3	3
	Disposition	0.597	3	2	1

4 Conclusions and policy recommendations

4.1 Conclusions The rural collective construction land transfer is accelerating, and there are many factors affecting the transfer price. Taking Yichang City as the study area, this paper establishes hedonic price model to analyze the factors that affect collective construction land transfer price. The simulation results show that in geographical factors, the higher degree of prosperity, road accessibility and soundness of infrastructure will result in higher collective construction land transfer price; in economic factors, the higher farmers' per capita net income and added value of the village's tertiary industry will lead to higher collective construction land transfer price; in ownership factors, the integrity of usufruct, disposition and possession has increasingly significant impact on collective construction land transfer price. The lack of ownership is the main reason for collective construction land transfer price fluctuations. The imperfect laws and regulations related to rural collective construction land transfer have caused the lack of possession, usufruct and disposition.

4.2 Policy recommendations (i) The government should gradually improve the collective construction land conditions in rural construction, enhance rural road accessibility, and strengthen infrastructure building. (ii) It is necessary to strengthen rural economic construction, improve the rural industrial structure, invigorate the rural economy, rely on market economic means to activate idle rural collective construction land, change land use patterns in rural areas, improve the social security system, and improve economic attributes of collective construction land. (iii) It is necessary to establish and improve the laws and regulations related to China's rural collective construction land, define rural collective construction land use rights, give full possession, usufruct and disposition, and strengthen the supervision over rural collective construction land transfer to reasonably use it and fully protect farmers' interests.

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the highest in Xi'an (0.5400), and it was the lowest in Shangluo City (0.1649). It is clearly seen that there were big differences between various cities in the comprehensive carrying capacity. Xi'an is the provincial capital and economic, political and cultural social center of Shaanxi Province, and its comprehensive influence and external competitiveness are great, so its comprehensive carrying capacity ranked firstly. Baoji and Xianyang cities are located in Guanzhong economic zone, so transportation is convenient, and they can use advantages of education, science and technology, and culture of Xi'an. In Yulin which is the important region of a series of national plans, economy and society have developed rapidly, and comprehensive strength has enhanced obviously. The production and living carrying capacity in Ankang City were low, but its population was relatively small, and local government adopted a series of measures to protect the environment to promote ecological protection in Ankang, so the ecological and comprehensive carrying capacity in Ankang were higher in the province. Yan'an and Tongchuan are resource and tourist cities, and it is inevitable to affect ecological environment during the process of exploiting and utilizing resources. Moreover, the price of coal was low in recent years, which has affected economic development to a certain extent. Hanzhong and Shangluo cities are located in the south of Shaanxi Province, and their comprehensive carrying capacity was low because of natural conditions and slow development of society and economy.

4 Conclusions and suggestions

Based on relevant plans, policies and references, from the perspective of land functions, the evaluation indicator system of carrying capacity of land resources containing production, living and ecological functions was established, and the carrying capacity of land resources in the ten cities of Shaanxi Province in 2013 was assessed and analyzed. It is found the assessment results accorded with the actual situation of economic and social development and could reflect the current condition of carrying capacity of land resources in different cities of Shaanxi Province.

In this study, only the spatial distribution of carrying capacity of land resources in various cities of Shaanxi Province in 2013 was discussed, but due to the inconformity of statistical caliber and difficulty of data collection, there is no horizontal analysis and comparison of time series as well as comparison between spatial and temporal distribution of carrying capacity of land resources. At the same time, the carrying capacity of land resources in Shaanxi Province was not predicted, and the actual values and prediction values were not compared, which needs to be studied further.

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