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Analysis of the Impact of Ownership Type on Construction Land Prices Under the Influence of Government Decision-Making Behaviors in China: Empirical Research Based on Micro-Level Land Transaction Data

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Abstract: Under China's dual land ownership system, the use rights of urban land (state-owned) and rural land (collective-owned) are not equal. Understanding the roles of ownership type and government decision-making behaviors in the formation of land prices is crucial for further reform to promote "equal rights and equal prices" for urban and rural land. This paper analyzed the impact of ownership type on construction land prices using micro-level land transaction data from Wujin District, Changzhou City, from 2015 to 2021 and investigated the role of government decision-making behaviors such as spatial planning and supply plan in this relationship. The results show that collective ownership has a negative impact on land prices, and the development of collective-owned construction land has a positive impact on the prices of adjacent land. In addition, the boundary of downtown areas determined by spatial planning enhances the negative impact of collective ownership on land prices, thus widening the price gap between state and collective-owned land within the downtown areas. Furthermore, the proportion of collective-owned construction land in the annual land supply determined by the land supply plan strengthens the negative impact of collective ownership on land prices, meaning that an increase in the supply of collective-owned construction land leads to further downward pressure on land prices. This study can provide insights for policy making aiming to achieve "equal rights and equal prices" for land with different ownership type in China and in other countries with a dual land ownership system.

Keywords: construction land prices; ownership type; spatial planning; supply plan; micro-level land transaction data

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1. Introduction

China has long implemented a dual land ownership system, with a state ownership of land in urban areas and a collective ownership of land in rural and suburban areas, under which collective land can only enter the market after being requisitioned and converted into state-owned land. In recent years, the requisition-based development model has been weakened due to policies like the Occupation-compensation Balance of Farmland, the Increase–decrease Linkage between Urban and Rural Construction Land, and Narrowing the Scope of Land Requisition. Instead, the stock-based development model has become an alternative approach, with one key breakthrough being the legalization of the entry of collective-owned construction land (COCL) into the market. This reform aims to fill the demand–supply gap in construction land quotas, improve allocation efficiency of rural

land, expand land revenue for the government, increase farmers' income, and promote urban–rural integration [1,2].

The marketization reform of COCL was officially launched in 15 pilot counties (cities/districts) in February 2015 and expanded to 33 regions in September 2016. Then, the pilot period of this reform was extended until the end of 2019. In January 2020, the revised Land Management Law in China was implemented, allowing rural collective land designated for industrial, commercial, and other business purposes to be used for enterprises or individuals on a paid basis through modes such as transfer, equity participation, and leasing. The goal of this reform is to establish an integrated urban–rural construction land market and achieve "equal rights and equal prices" for both types of land [3]. "Equal rights" refers to the legal unity of the use rights of collective- and state-owned construction land, while "equal prices" refers to the same price formation mechanism for both [4].

As this reform has deepened and expanded, studies on COCL have increased significantly, with one key issue being the impact of ownership type (i.e., state-owned or collective-owned) on construction land prices (i.e., the transfer prices of land planned for construction purposes). Scholars mostly believe that the factors influencing construction land prices can be categorized into five types. The first type is parcel characteristics of land, including land area, usage duration, use type, transaction mode, transaction time, and floor area ratio [5–7]. The second type is geographic location of land, including distance from land to city centers, commercial hubs, schools, parks, and water sources [8–10]. The third type is neighborhood conditions of land, including population, GDP, fiscal revenue, and per capita income [11,12]. The fourth type is property rights of land, including land ownership types and integrity of property rights [13–15]. The fifth type is land policies, including land supply policies and spatial planning regulations [16–18].

However, previous studies rarely quantitatively verified the impact of ownership type on construction land prices, and failed to consider the role of government decision-making behaviors such as spatial planning and supply plan in this relationship. To further explain the mechanism of the formation of construction land prices, it is necessary to address the following questions: How does ownership type affect construction land prices? What role do government decision-making behaviors such as spatial planning and supply plan play in this process?

Based on the theoretical framework of property rights affecting the realization of land value, this paper analyzed the impact of ownership type on construction land prices in China using the Spatial Durbin Model (SDM) in the GeoDa V1.20 software based on micro-level land transaction data from Wujin District, Changzhou City, from 2015 to 2021. In addition, this study introduced spatial planning and supply plan as moderating variables to analyze their role in the relationship between ownership type and construction land prices. The results can provide a better understanding on the pricing of land with different ownership types for the academic circle, as well as a decision-making basis for further reform to promote "equal rights and equal prices" for urban and rural land in China and in other countries.

2. Materials and Methods

2.1. Theoretical Framework

Property rights is the foundation for the realization of land value, and its completeness affects the extent to which land value is realized [15]. Under current Land Management Law in China, the use rights of collective- and state-owned construction land are granted equal status and can enter the market on an equal footing. However, in actual economic activities, the use rights of COCL remain subject to greater restrictions compared to that of state-owned construction land, such as discouraging its development in downtown

areas and controlling its supply scale by the government, leading to more severe deficiencies in property rights and hindering the realization of their values. Following the fundamental logic that the property rights system affects the realization of land value, this paper quantitatively analyzed the impact of ownership type on construction land prices under the context of the marketization reform of COCL. Building on this foundation, we introduced spatial planning and supply plan as variables to analyze the role of government decision-making behaviors in the relationship between ownership type and construction land prices. The theoretical framework and hypotheses for this paper are illustrated in Figure 1.

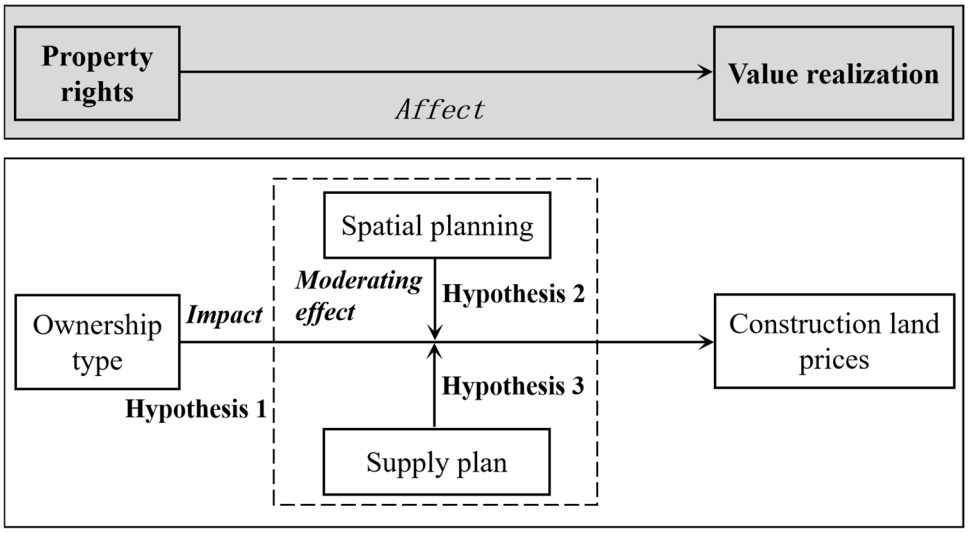


Figure 1. Theoretical framework.

Ownership serves as the prerequisite for exercising the four rights of land: possession, use, disposition, and income generation [19]. The use rights of COCL are subject to more restrictions by the government such as discouraging its development in downtown areas and limiting its supply scale compared to state-owned construction land, resulting in its poorer exclusivity and stability, which inevitably constrains its market value. Under such circumstances, the use rights of collective-owned land are weaker than that of state-owned land. Therefore, this study proposes Hypothesis 1: compared to state ownership, collective ownership tends to lower construction land prices.

During the last three decades, the continuous expansion of urban space has resulted in the scarcity of construction land, thus compelling the government to impose restrictions on urban development boundaries. The Urban Planning Compilation Measures (2006 Version) explicitly stipulates that urban growth boundaries must be delineated in the planning of downtown areas (i.e., the core area within a city that undertakes primary urban functions) by local urban planning authorities to limit urban sprawl and development, making spatial planning a core component of urban planning [20]. Land-use planning serves as the basis for land-use regulation and a tool to control land utilization behaviors, aiming to achieve rational allocation of land resources [21]. The distinction between urban and rural areas, manifested in different expression in spatial planning and land-use regulation, is the root cause of the inequality in rights between collective- and state-owned land [22]. As the architects of territorial spatial planning, local governments constrain urban land development by demarcating downtown areas. Some studies revealed that prices of COCL are significantly lower than those of state-owned land, with the price gap within downtown areas exceeding that in rural areas [23]. Thus, this paper proposes Hypothesis 2: the boundaries of downtown areas defined by spatial planning exert a negative moderating

effect on the impact of collective ownership on construction land prices, amplifying the downward pressure of collective ownership on land values.

Local land management authorities regulate the market through the formulation of a land supply plan intended to maintain the stability of land prices, which distorts the supply–demand dynamics and suppresses the premium potential. Under the policy guidance of Narrowing the Scope of Land Requisition, local governments tend to integrate both collective- and state-owned land into their land supply plan. When total land supply increases, competition among land buyers becomes weaker, which leads to lower prices [7]. Similarly, when the proportion of collective-owned land in the total construction land supply rises, competition among land buyers becomes weaker, which further depresses its prices. Therefore, this study proposes Hypothesis 3: the proportion of collective-owned land in the annual total land supply, as determined by the land supply plan, exerts a negative moderating effect on the relationship between collective ownership and construction land prices, amplifying the negative impact of collective ownership on land values.

2.2. Study Area

Wujin District, Changzhou City, is located in the highly developed core area of the Yangtze River Delta in China and governs 11 towns and 5 sub-districts (Figure 2). In 2019, its secondary and tertiary industries accounted for 98.4% of the total GDP, with the national average being 92.9%; its urbanization rate was 68.14%, with the national average being 60.6%; its per capita disposable income of rural residents was CNY 32,400, with the national average being CNY 16,021 [24,25]. This shows that industrialization, urbanization, and income levels in Wujin District are significantly higher than the national average. As one of the birthplaces of the "Southern Jiangsu Model" regarding economic development, Wujin District has a large number of collective- and private-owned enterprises, leading to a huge potential demand for COCL. In September 2016, Wujin District was selected as one of the second batch of pilots for the marketization reform of COCL, implementing the same transaction platform for collective and state-owned construction land. With a longer reform history and a more mature market, Wujin District is at the forefront of this reform and serves as an ideal subject for this study.

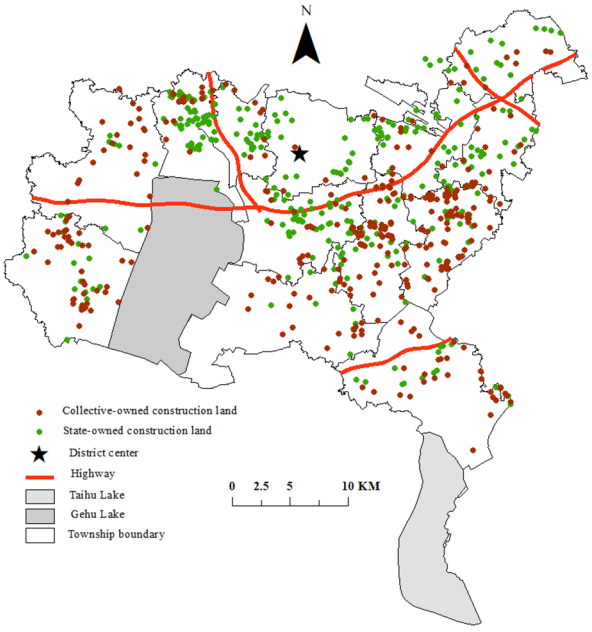


Figure 2. The transferred construction land in Wujin District from 2017 to 2021.

2.3. Data Sources

This study used a web-scraping technique to collect data on collective- and state-owned construction land transactions in Wujin District from 2017 to 2021 from the Jiangsu Land Market Network. The data included land location, total transfer price, area, usage period, use purpose, planning indicators, transaction mode, and transaction time. The GeoCoding V6.14 tool was used to obtain the latitude and longitude co-ordinates corresponding to each land parcel's location. From 2017 to 2021, there were 1430 parcels of COCL transferred with a total area of 1104.8 ha in Wujin District, of which more than 90% were industrial and commercial land. This indicates that industrial and commercial land dominate the collective-owned land market in Wujin District. Since COCL cannot be used for commercial residence development, the intersection of use purposes between collective- and state-owned land mainly lies in industrial and commercial uses. Therefore, this study excluded residential land from the sample data and used industrial and commercial land as representatives for the regression analysis of construction land prices.

Additionally, vector and raster data of administrative boundaries and centers, transport routes and stations, schools, parks, lakes, rivers, population density, and GDP density were driven from the Data Center of Resources and Environment Science, built by the Institute of Geographic Sciences and Natural Resources Research at the Chinese Academy of Sciences [26]. Data on the boundary of downtown areas were obtained from the Changzhou City Urban Master Plan (2011–2020) [27] and were spatially delineated using Google Earth.

2.4. Model Construction

To verify the hypotheses, this study employed a Hedonic Price Model to analyze the impact of ownership type on construction land prices and used a Moderating Effect Model to analyze the role of spatial planning and supply plan in this relationship.

2.4.1. Hedonic Price Model

The hedonic price model is widely used for analyzing the influencing factors of land prices [8,28]. It decomposes the research object into multiple component attributes and obtains the coefficients of each attribute through spatial regression models [29,30]. In this model, land is a comprehensive commodity affected by land parcel attributes, geographic locations, and neighborhood characteristics, and its prices are determined by these factors combined. The conceptual formula of the hedonic price model can be expressed as follows:

$$P = f(L, G, N) \tag{1}$$

where P is the land prices, L is the land parcel attributes, G is the geographic locations, and N is the neighborhood characteristics.

The Ordinary Least Squares (OLS) model is widely used to analyze the influencing factors of land prices, but it ignores the spatial dependence between observations, leading to potential bias in results. The Spatial Durbin Model (SDM) considers the spatial dependence between observations and produces more accurate results than the OLS model. The parameter results of these two models are the same for all spatial units, i.e., globally unified. Therefore, this study uses the SDM to explain the influencing factors of land prices.

The SDM is a combined and extended form of Spatial Lag Model (SLM) and Spatial Error Model (SEM), constructed by imposing specific constraints on both models. It not only accounts for interaction effects between explained variables but also incorporates interaction effects between explained and explanatory variables. Its econometric formulation is expressed as follows:

$$Y = \alpha + \rho W_1 Y + \beta X + \delta W_2 X + \varepsilon \tag{2}$$

Here, the meanings of Y, X, α, ρ, β, and ε are consistent with those in Formula (2). W_1 and W_2, respectively, represent the spatial contiguity weight matrices for the explained and explanatory variables, which are the same in this formula. δ denotes the spatial autocorrelation coefficients of the explanatory variables, with values ranging between -1 and 1, reflecting the influence relationship between the explanatory variables of neighboring spatial units and the explained variable of the focal unit. When $\delta = 0$, the model retains the spatially lagged explained variable while excluding the spatially lagged explanatory variables, thereby changing to SLM. When $\rho = 0$, the model incorporates the spatially lagged explanatory variables but removes the spatially lagged explained variable, evolving into SLM for explanatory variables. When both $\delta = 0$ and $\rho = 0$, the spatial lag effects of both the explained and explanatory variables are disregarded, and the model simplifies to the OLS model. If a spatially lagged random error term $\lambda W\varepsilon$ is further introduced, the model transforms into SEM.

2.4.2. Moderating Effect Model

The Moderating Effect Model is a commonly used method in studies on land prices [14,31]. As shown in Figure 3, if the relationship between the explanatory variable X and the explained variable Y is influenced by a third variable M, it is considered that M has a moderating effect on the relationship between X and Y, and M is referred to as the moderator variable [32]. The moderator variable affects the direction and strength of the relationship between the explanatory and explained variables, meaning that the sign and magnitude of the regression slope between the explanatory and explained variables will change under different values of the moderator variable [33]. By constructing interaction terms between the explanatory and moderator variables, the moderating effect of the moderator variable can be evaluated. The moderating effect model can be finally established as follows:

$$Y = \alpha + X + \beta_2 M + \beta_3 XM + \varepsilon \quad (3)$$

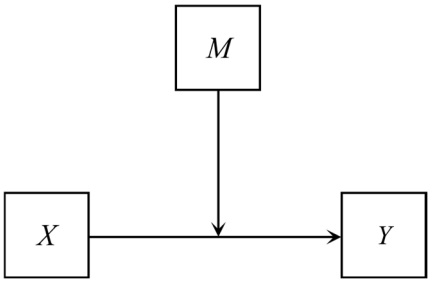


Figure 3. Conceptual diagram of moderating effect.

If the regression coefficient of the interaction term XM is significant, it indicates that the moderating effect of variable M is significant, and the regression coefficient can measure the moderating effect of variable M.

There are four situations for the moderating effects:

(1) The main effect (the regression coefficient of the explanatory variable when the interaction term is not introduced) is positive and the coefficient of the interaction term is positive, indicating that the moderator variable M has a positive moderating effect. This means that M strengthens the positive impact of X on Y, i.e., when M has a high value, it enhances the positive impact.

(2) The main effect is positive and the coefficient of the interaction term is negative, indicating that the moderator variable M has a negative moderating effect. This means that M weakens the positive impact of X on Y, i.e., when M has a high value, it reduces the positive impact.

(3) The main effect is negative and the coefficient of the interaction term is positive, indicating that the moderator variable *M* has a positive moderating effect. This means that *M* weakens the negative impact of *X* on *Y*, i.e., when *M* has a high value, it reduces the negative impact.

(4) The main effect is negative and the coefficient of the interaction term is negative, indicating that the moderator variable *M* has a negative moderating effect. This means that *M* strengthens the negative impact of *X* on *Y*, i.e., when *M* has a high value, it enhances the negative impact.

2.5. Variable Selection and Descriptive Statistics

2.5.1. Variable Selection

To analyze the impact of ownership type on construction land prices and the role of government decision-making behaviors such as spatial planning and supply plan in the relationship, this study used SPSS V19.0 software to perform VIF tests on construction land prices and potential influencing factors. After eliminating factors with a VIF over 10 and collinearity, 1 core explanatory variable, 14 control variables, and 2 moderating variables were selected (Table 1).

(1) Explained variable

The explained variable is land prices (*Y*), which equals the total transfer price of land divided by plot area. In addition, the Consumer Price Index (CPI) was used to adjust land prices to the same period in 2019 to eliminate the influence of inflation, thereby enhancing the comparability of data from different years.

(2) Core explanatory variable

Under the dual land ownership system in China, the property rights of collective-owned land are more incomplete, hindering the realization of its value. This study selected ownership type (*E*) as the core explanatory variable to analyze its impact on construction land prices. If the land is collective-owned, it is assigned a value of 1, indicating relatively incomplete property rights. If the land is state-owned, it is assigned a value of 0, indicating relatively complete property rights.

(3) Moderator variables

This study analyzed the moderating role of spatial planning and supply plan in the relationship between ownership type and construction land prices.

This study introduced spatial planning (E_1) as a variable to analyze its moderating role in the impact of ownership type on construction land prices. Local authorities develop spatial planning to delineate the boundary of downtown areas, which constrains urban land development. Within the boundary of downtown areas, local authorities tend to prioritize land requisition and large-scale development, while imposing more restrictions on the development of COCL. Driven by the pursuit of land appreciation and risk aversion, enterprises incline to avoid investing in COCL with poorer investment attributes and higher potential risks, which may have different impacts on the expected returns of COCL inside and outside the boundary of downtown areas. Therefore, this study selected the boundary of downtown areas as the measurement of spatial planning made by local authorities. If the land parcel is located within the boundary of downtown areas, it is assigned a value of 1. If the land parcel is located outside the boundary, it is assigned a value of 0.

In addition, this study introduced supply plan (E_2) as a variable to verify its moderating role in the impact of ownership type on construction land prices. A land supply plan is an important tool for local authorities to regulate the land market. An increase in the supply of land typically leads to lower land prices. Local authorities regulate the land

market through the formulation of a supply plan that takes consideration of both state- and collective-owned land, which distorts the supply–demand relationship in the land market and may affect the expected returns of COCL. Therefore, this study selected the proportion of COCL in the total annual land supply as a measurement of supply plan decided by local authorities.

(4) Control variables

The control factors influencing land prices can be categorized into three types: parcel attributes, location attributes, and neighborhood attributes. Land parcel attributes include area (X_1), term (X_2), and time (X_3). Location attributes include the distance to district center (X_4), the distance to township or sub-district center (X_5), the distance to highway exit (X_6), the distance to major road (X_7), the distance to train station (X_8), the distance to park (X_9), the distance to school (X_{10}), the number of schools (X_{11}), and the distance to water source (X_{12}). Neighborhood attributes include population density (X_{13}) and GDP density (X_{14}).

Table 1. Selection and definition of variables.

Category	Variable	Symbol	Definition
Explained variable	Land price	Y	Total transfer price of land/Plot area (1000 CNY/m^2)
Core explanatory variable	Ownership type	E	"1" indicates that the plot is collective-owned, "0" indicates state-owned
Moderator variables	Spatial planning	M_1	"1" indicates the plot is within the boundary of downtown areas, "0" indicates outside
	Supply plan	M_2	Proportion of collective-owned land in the annual total land supply (%)
Plot attributes	Area	X_1	Plot area of land (m^2)
	Term	X_2	Transfer term of land-use right (years)
	Time	X_3	Year of land transfer (year)
Location attributes	Distance to district center	X_4	Distance from the plot to the district administrative center (km)
	Distance to township or sub-district center	X_5	Distance from the plot to the nearest township or sub-district administrative center (km)
	Distance to highway exit	X_6	Distance from the plot to the nearest highway exit (km)
	Distance to major roads	X_7	Distance from the plot to the nearest major road (urban expressway and national, provincial, and county highways) (km)
	Distance to train station	X_8	Distance from the plot to the nearest train station (km)
	Distance to school	X_9	Distance from the plot to the nearest primary or secondary school (km)
	Number of schools	X_{10}	Number of primary and secondary schools within a 2 km radius of the plot
	Distance to park	X_{11}	Distance from the plot to the nearest park (km)
	Distance to water source	X_{12}	Distance from the plot to the nearest water source (rivers and lakes) (km)
Neighborhood attributes	Population density	X_{13}	Population density of the township or sub-district where the plot is located (1000 person/km^2)
	GDP density	X_{14}	Total GDP within a 1 km grid (billion CNY/km^2)

2.5.2. Descriptive Statistics of Main Variables

Compared to state-owned construction land, COCL exhibits significantly lower prices, smaller plots, longer distances to the district center and roads at various levels, and notably lower population density and GDP density (Table 2). These findings indicate that COCL has lower use value, poorer locations, and weaker potential demand compared to state-owned construction land.

Table 2. Descriptive statistics of main variables.

Variable	Collective-Owned Construction Land			State-Owned Construction Land		
	Observation	Mean	STD	Observation	Mean	STD
Y	1426	0.371	0.276	249	0.759	1.190
E	1426	1		249		
X_1	1426	7202.004	15,956.008	249	25,086.013	34,601.351
X_2	1426	49.804	1.705	249	48.394	4.703
X_3	1426	2018.227	0.551	249	2018.920	1.345
X_4	1426	16.525	5.166	249	11.763	6.054
X_5	1426	3.461	1.929	249	3.755	1.850
X_6	1426	7.426	2.857	249	4.521	2.720
X_7	1426	0.896	0.702	249	0.687	0.592
X_8	1426	11.424	8.032	249	16.486	8.285
X_9	1426	1.246	0.627	249	1.372	0.656
X_{10}	1426	2.979	2.242	249	3.177	3.955
X_{11}	1426	6.958	4.992	249	6.805	3.505
X_{12}	1426	4.248	2.566	249	4.404	2.700
X_{13}	1426	1.430	0.720	249	2.090	1.350
X_{14}	1426	0.224	0.050	249	0.286	0.091

3. Results

3.1. Impact of Ownership Type on Construction Land Prices

This study used SDM to analyze the impact of ownership type on construction land prices. The main effect (Main) results of SDM show that the regression coefficient of ownership type (E) is negative at the 1% significance level (Table 3), indicating that collective ownership lowers construction land prices, which supports Hypothesis 1. Compared to state-owned construction land, COCL is subject to restrictions by the government such as discouraging its development in downtown areas and limiting its supply scale, resulting in weaker exclusivity and stability of its use rights, thereby limiting its market prices. In addition, construction land prices are also influenced by plot attributes and location attributes. From the perspective of plot attributes, area (X_1) has a positive impact on construction land prices at the 1% significance level, while term (X_2) has a negative impact at the 1% significance level. This indicates that bigger plots are conducive to the formation of larger-scale industrial clusters, which is beneficial for land appreciation. The investment intensity of commercial land is usually higher than that of industrial land, but the corresponding use term is generally shorter, presenting a phenomenon of longer use term corresponding to lower land prices. From the perspective of location attributes, the distances to main roads (X_7) and schools (X_9) both have negative impacts on construction land prices at the 1% significance level. This indicates that advanced mobility systems and convenient access to schools can attract more enterprises to buy land, thus driving up its prices.

The spatial effect (Wx) results of SDM (Table 3) show that the spatial effect regression coefficient of construction land prices (Y) is at the 1% significance level, indicating that it has a significant positive spatial spillover effect. This demonstrates that spatially adjacent land parcels, when classified into comparable land grades through zoning practices, tend to develop approximating prices through the market, leading to positive mutual impact between adjacent parcels. In addition, the spatial effect regression coefficient of ownership type (E) is positive at the 1% significance level, with the opposite sign to the main effect regression coefficient, indicating that the spatial effect of ownership type on construction land prices is opposite to the main effect. This means that the development of COCL has a positive impact on prices of adjacent land. This can be attributed to the agglomeration economies generated through the development of COCL, which stimulates co-ordinated

infrastructure investment and economic concentration in the region, consequently creating a positive external effect on local land market.

Table 3. Analysis results of SDM regression for the impact of ownership type on construction land prices.

Variables		lnY	
		Coefficients	**STD**
Main	E	−0.228 ***	0.033
	$\ln X_1$	0.018 **	0.009
	$\ln X_2$	−2.116 ***	0.157
	X_3	0.014	0.013
	$\ln X_4$	0.126	0.184
	$\ln X_5$	0.023	0.056
	$\ln X_6$	0.092	0.076
	$\ln X_7$	−0.037 ***	0.011
	$\ln X_8$	0.022	0.095
	$\ln X_9$	−0.122 ***	0.029
	X_{10}	0.003	0.008
	$\ln X_{11}$	0.058	0.082
	$\ln X_{12}$	−0.009	0.025
	$\ln X_{13}$	−0.136 *	0.072
	$\ln X_{14}$	−0.028	0.080
Wx	$\ln Y$	0.503 ***	0.045
	E	0.203 ***	0.072
	$\ln X_1$	0.088 ***	0.025
	$\ln X_2$	0.250	0.408
	X_3	−0.045	0.034
	$\ln X_4$	−0.157	0.193
	$\ln X_5$	−0.023	0.063
	$\ln X_6$	−0.106	0.084
	$\ln X_7$	0.041 **	0.016
	$\ln X_8$	−0.003	0.101
	$\ln X_9$	0.181 ***	0.043
	X_{10}	0.005	0.011
	$\ln X_{11}$	−0.044	0.085
	$\ln X_{12}$	−0.007	0.030
	$\ln X_{13}$	0.122	0.086
	$\ln X_{14}$	0.051	0.108
	R^2	0.392	
	Log LIK	−678.722	
	AIC	1421.440	
	SC	1595.000	
	Observation	1675	

Notes: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

3.2. Moderating Effect of Spatial Planning on the Impact of Ownership Type on Construction Land Prices

This study further introduced spatial planning and used SDM to analyze its moderating role in the relationship between ownership type and construction land prices. The main effect (Main) results of SDM show that the regression coefficient of the interaction term between ownership type and spatial planning ($E \times M_1$) is negative at the 1% significance level (Table 4). This indicates that the boundary of downtown areas, determined by spatial planning, enhances the negative impact of collective ownership on construction land prices, which supports Hypothesis 2. In other words, compared to regions outside the boundary

of downtown areas, the price gap between state- and collective-owned land is larger within because local authorities tend to prioritize land requisition and large-scale development within downtown areas, while imposing more restrictions on the development of COCL. Driven by the pursuit of land appreciation and risk aversion, enterprises tend to avoid investing in COCL with poor investment attributes and weaker exclusivity, which widens the price gap between state- and collective-owned land.

Table 4. Analysis results of moderating effect of spatial planning on the impact of ownership type on construction land prices.

Variables		$\ln Y$	
		Coefficients	**STD**
Main	$E \times M_1$	−0.241 ***	0.066
	E	−0.136 ***	0.041
	M_1	0.225 **	0.100
	$\ln X_1$	0.017 **	0.009
	$\ln X_2$	−2.141 ***	0.157
	X_3	0.012	0.013
	$\ln X_4$	0.128	0.183
	$\ln X_5$	0.013	0.055
	$\ln X_6$	0.093	0.075
	$\ln X_7$	−0.043 ***	0.011
	$\ln X_8$	0.021	0.094
	$\ln X_9$	−0.122 ***	0.030
	X_{10}	0.000	0.008
	$\ln X_{11}$	0.040	0.081
	$\ln X_{12}$	−0.012	0.025
	$\ln X_{13}$	−0.141 **	0.071
	$\ln X_{14}$	−0.047	0.080
Wx	$\ln Y$	0.504 ***	0.045
	$E \times M_1$	0.184 *	0.111
	E	0.152 *	0.089
	M_1	−0.212	0.129
	$\ln X_1$	0.096 ***	0.026
	$\ln X_2$	0.167	0.413
	X_3	−0.043	0.035
	$\ln X_4$	−0.164	0.194
	$\ln X_5$	−0.011	0.063
	$\ln X_6$	−0.110	0.083
	$\ln X_7$	0.047 ***	0.016
	$\ln X_8$	−0.005	0.101
	$\ln X_9$	0.181 ***	0.044
	X_{10}	0.007	0.011
	$\ln X_{11}$	−0.021	0.085
	$\ln X_{12}$	0.000	0.030
	$\ln X_{13}$	0.132	0.086
	$\ln X_{14}$	0.076	0.109
	R^2	0.397	
	Log LIK	−671.653	
	AIC	1415.310	
	SC	1610.550	
	Observation	1675	

Notes: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The spatial effect (Wx) results of SDM (Table 4) show that the regression coefficient of the interaction term between ownership type and spatial planning ($E \times M_1$) is positive at the 10% significance level, with the opposite sign to the main effect regression coefficient, indicating that the moderating effect of spatial planning presents a positive spatial spillover effect. This means that the positive radiation effect of the development of COCL on prices of adjacent land within the boundary of downtown areas is stronger than that outside. This may be because downtown areas have better infrastructure and higher land appreciation space, providing greater promotion to nearby land prices.

3.3. Moderating Effect of Supply Plan on the Impact of Ownership Type on Construction Land Prices

This study further introduced supply plan and used SDM to analyze its moderating role in the relationship between ownership type and construction land prices. When considering spatial correlation, the main effect (Main) results of SDM (Table 5) show that the regression coefficient of the interaction term between ownership type and supply plan ($E \times M_2$) is negative at the 1% significance level. This indicates that the proportion of COCL in the annual land supply, determined by the land supply plan, weakens the negative impact of collective ownership on construction land prices, which supports Hypothesis 3. In other words, an increase in the proportion of COCL in the annual land supply further widens the price gap between state- and collective-owned land. This may be because COCL has weaker competitiveness due to more incomplete property rights and worse location conditions. When the proportion of COCL in the annual land supply increases, the situation of oversupply will escalate, leading to further downward pressure on land prices.

The spatial effect (Wx) results of SDM (Table 5) show that the regression coefficient of the interaction term between ownership type and supply plan ($E \times M_2$) is no longer significant, indicating that the moderating effect of supply plan does not have a spatial spillover effect. This means that the impact of ownership type on construction land prices is limited to the local parcel and does not affect the prices of adjacent parcels, regardless of changes in land supply plan.

Table 5. Analysis results of moderating effect of supply plan on the impact of ownership type on construction land prices.

Variables		lnY	
		Coefficients	**STD**
Main	$E \times M_2$	−0.689 **	0.309
	E	0.602 ***	0.185
	M_2	0.379	0.274
	$\ln X_1$	0.087 ***	0.024
	$\ln X_2$	−0.115	0.410
	X_3	−0.070 *	0.042
	$\ln X_4$	−0.094	0.189
	$\ln X_5$	−0.023	0.061
	$\ln X_6$	−0.111	0.082
	$\ln X_7$	0.043 ***	0.016
	$\ln X_8$	−0.012	0.098
	$\ln X_9$	0.181 ***	0.043
	X_{10}	0.008	0.011
	$\ln X_{11}$	−0.037	0.083
	$\ln X_{12}$	−0.008	0.030
	$\ln X_{13}$	0.100	0.084
	$\ln X_{14}$	−0.019	0.106

Table 5. *Cont.*

Variables		lnY	
		Coefficients	**STD**
Wx	lnY	0.437 ***	0.049
	$E \times M_2$	−0.730 ***	0.107
	E	0.245 ***	0.067
	M_2	0.061	0.094
	$\ln X_1$	0.012	0.009
	$\ln X_2$	−2.056 ***	0.154
	X_3	−0.046 ***	0.016
	$\ln X_4$	0.048	0.181
	$\ln X_5$	0.032	0.054
	$\ln X_6$	0.101	0.074
	$\ln X_7$	−0.037 ***	0.011
	$\ln X_8$	0.020	0.092
	$\ln X_9$	−0.110 ***	0.029
	X_{10}	0.003	0.008
	$\ln X_{11}$	0.055	0.080
	$\ln X_{12}$	−0.005	0.025
	$\ln X_{13}$	−0.118 *	0.070
	$\ln X_{14}$	−0.002	0.078
	R^2	0.442	
	Log LIK	−290.285	
	AIC	652.570	
	SC	842.025	
	Observation	1426	

Notes: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4. Discussion and Conclusions

Under China's dual urban–rural land ownership system, the unequal legal status of collective- and state-owned land hinders the realization of "equal rights and equal prices" for both. Based on the theoretical framework of property rights affecting the realization of land value, this study analyzed the impact of ownership type on construction land prices in China using micro-level land transaction data from Wujin District, Changzhou City, from 2015 to 2021, employing SDM. Then, this study introduced spatial planning and supply plan as moderating variables to comprehensively analyze their role in the relationship between ownership type and construction land prices. The research results show that collective ownership has a negative impact on land prices, and the development of adjacent COCL has a positive impact on land prices. In addition, the boundary of downtown areas determined by spatial planning enhances the negative impact of collective ownership on land prices, thus widening the price gap between state- and collective-owned land within the downtown areas. Furthermore, the proportion of COCL in the annual land supply determined by the land supply plan strengthens the negative impact of collective ownership on land prices, meaning that an increase in COCL supply leads to further downward pressure on land prices. The findings not only confirm the negative impact of collective ownership on land prices [13,34] but also discover the moderating role of spatial planning and supply plan in this relationship.

The findings can provide policy implications for promoting "equal rights and equal prices" for urban and rural construction land in China. The first policy suggestion is that equivalent development control indicators should be established for collective- and state-owned land within the same locations and for the same intended uses. The second policy suggestion is that the supply of COCL should be co-ordinated based on market

demand and policy momentum to achieve rational regulations on land prices. The third policy suggestion is that the restrictions imposed by territorial spatial planning on COCL development within the downtown areas should be relaxed to grant collective- and state-owned land with "equal rights". The findings can also provide policy implications for the optimization of land pricing in other countries with a dual land ownership system.

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