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Can the Marketization of Land Transfer Reduce Carbon Emissions?

-- Empirical Research based on Western China

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Abstract

It is of great significance for China to promote carbon emission reduction strategy and promote regional economic and social development to explore the impact of land transfer marketization on carbon emissions. This paper takes the western region as the research area, uses the mediation effect model, and uses the carbon emission data in western China from 2011 to 2017. The industrial structure optimization index is used as a mechanism to empirically examine the impact of the marketization of land transfer on carbon emissions, in order to provide certain policy references for the marketization of land elements in the western region and the green development of the region. The results show that: (1) The marketisation of land concessions is in part driving the growth of carbon emissions. (2) The marketization of land transfer leads to the reverse development of the rationalization of the industrial structure, thereby promoting the increase of provincial carbon emissions. (3) The marketization of land transfer will suppress the increase of carbon emissions by promoting the development of a highly sophisticated industrial structure.

Keywords

Marketization of Land Transfer; Carbon Emission; Optimization of Industrial Institutions; Inte-rmediary Effect.

1. Introduction

Since the reform and opening up, China's economic scale has grown by leaps and bounds. The development model characterized by high investment, high energy consumption and high emissions has contributed greatly to maintaining this high-speed growth momentum. However, the problem of environmental pollution has become increasingly prominent. As one of the means of local government's macro-control, land policy has gradually played an increasingly important role in developing regional economy and adjusting industrial structure. Among them, land transfer policy is to directly use land resources such as land transfer price and scale among related industries. The configuration of industrial structure can be adjusted and upgraded, which in turn will have an impact on carbon emissions. Under the pressure of reducing carbon emissions, it is of great practical significance to study how the market-oriented reform of land transfer can promote the reduction of carbon emissions by optimizing the industrial structure.

The existing literature shows that the market-oriented allocation of industrial land can promote the optimization and upgrading of the industrial structure to a certain extent[1-5]. In addition, research on the impact of industrial structure on carbon emissions. On the one hand, some studies follow the traditional factor decomposition method, measure the contribution of industrial structure to regional carbon emissions at different spatial scales, and discuss its changing laws[6-7]. On the other hand, empirical research that takes industrial structure as one of the influencing factors of carbon emissions or energy consumption has become a hot topic.

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Most research results show that the share of the secondary industry has a significant positive impact on carbon emissions and energy consumption at various regional scales[8-9]. At the same time, there is a significant potential emission reduction contribution from the change of industrial structure[10,11]. Regarding the research on the impact of land transfer on carbon emissions, land finance and carbon emissions are the research hotspots, and they are also similar to the research subject of this paper. Literature shows that land finance and land urbanization have a significant impact on carbon emissions[12-14]. Through combing and analyzing the existing literature, it is found that scholars have done a lot of research on the relationship between the three, but the research on the overall relationship between the marketization of land transfer, the optimization of industrial structure and carbon emissions is still insufficient. , there is no unified research framework, especially the role mechanism and path of land marketization on carbon emissions through industrial structure optimization is rarely involved. In view of this, this paper takes the western region as the research area, on the basis of constructing the theoretical mechanism between the marketization of land transfer, the optimization of industrial structure and carbon emission, and uses the industrial structure optimization index as the mechanism to empirically investigate the effect of marketization of land transfer. impact on carbon emissions.

2. Heoretical Mechanism and Research Hypothesis

In reality, land is the basic production factor and space carrier, and the land transfer by local governments directly affects the scale or structure of regional industrial development, which is then reflected as the total amount or intensity of regional carbon emissions. As the land monopoly supplier and the main body of carbon emission reduction, under the background of the strong implementation of the national carbon emission reduction strategy and the local responsibility system for emission reduction targets[16], they have begun to consciously adjust the supply of industrial land to reduce regional carbon emissions. intervention.

Hypothesis 1 : the marketization of land transfer will reduce carbon emissions.

Wu and others used the logarithmic average Divisia index decomposition method to decompose the CO_2 emission growth rate of China's energy consumption into the weighted contribution of 11 driving factors. Among them, changes in economic structure have played a certain role in promoting the growth of CO2 emissions. It can be seen that if we want to slow down the growth of CO_2 emissions, develop the tertiary industry, and gradually reduce the proportion of industry in the economy will be a policy choice.

Hypothesis 2 : the optimization and upgrading of industrial institutions can promote the reduction of carbon emissions.

In the process of competition for growth, local governments tend to use low-priced land within their jurisdiction to introduce foreign industrial enterprises to stimulate economic growth. The agreement method has become an ideal choice for local governments to transfer industrial land. However, since the service industry is mainly oriented to the local market, it is difficult to be replaced by similar projects in other regions. Therefore, the local government's sales of commercial and residential land are often more inclined to the more market-oriented bidding, auction and listing method, and the service industry has a negative impact on the ecological environment. The pressure is far less than that of secondary industries such as industry. From this, it can be inferred that the impact of the marketization of land transfer on the optimization of industrial structure is mainly to adjust the proportion of land used for secondary and tertiary industries. Emissions have an impact. Due to the lack of market competitiveness and information disclosure, the negotiated transfer method has low land prices, while the bidding, auction and listing transfer methods screen land buyers through the competitive pricing mechanism of "higher price", which can restrain the transferee. People can improve the

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marginal output and production efficiency of input factors, amplify the driving effect of high value-added industrial enterprises, raise the entry threshold of low value-added enterprises, and indirectly, as a whole, optimize the regional industrial structure. The optimization of industrial structure can be summarized from two aspects: rationalization and high-level industrial structure. The former refers to the flow and allocation of production factors and resources among different industrial sectors to achieve a state of coordinated development and benign interaction; the latter refers to the reallocation of production resources to higher-gradient industries and the upgrading of socially-led industries. The constraint of land price cost will force some enterprises to carry out technological transformation and industrial upgrading, and transform to a low-energy, low-emission economic development mode, such as energy- and labor-intensive industries gradually transforming into capital-intensive industries. This process of industrial structure optimization often has a catalytic effect on reducing energy consumption and pollution emissions in economic development, thereby reducing carbon emissions.

Hypothesis 3: The marketization of land transfer will promote the heightening of the industrial structure, thereby reducing carbon emissions.

For enterprises, the marketization of land transfer will objectively increase land prices, which will force traditional industries to pay more attention to economic benefits and profitability, and pay less attention to environmental benefits. Departmental concentration, environment-friendly industries will face the dilemma of insufficient production resources.

Hypothesis 4: The marketization of land transfer will promote the rationalization of industrial structure, thereby increasing carbon emissions.

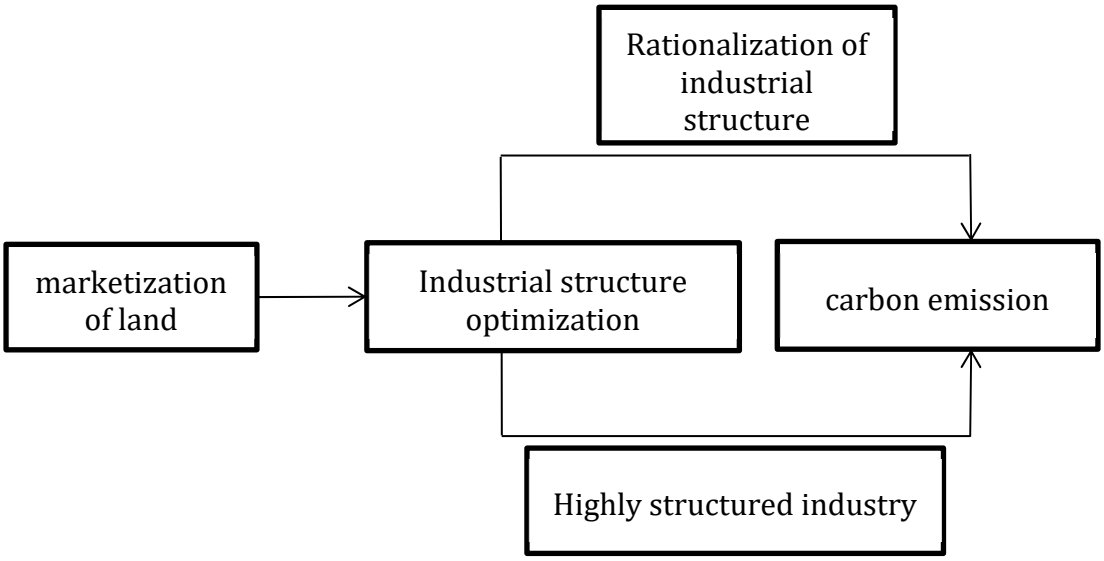

Fig 1. Research mechanism

On the whole, the impact mechanism of land transfer marketization on carbon emissions through industrial structure optimization can be analyzed from the two dimensions of industrial structure rationalization and industrial structure enhancement, and the two have opposite effects on carbon emissions in theory. However, it does not mean that the two effects cannot be reconciled. As for the final effect of land transfer marketization on carbon emissions through industrial structure optimization, it depends on the superposition of the negative effect through industrial structure rationalization and the positive effect through industrial structure heightening.

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3. Model Setting and Data Description

3.1. Model Design

According to the theoretical mechanism analysis and assumption of the impact of land transfer marketization on carbon emissions, a model of land transfer marketization-industrial structure optimization and upgrading-carbon emission conduction path model is constructed.

$$lnC_{it} = \alpha_0+\alpha_1 LM_{it}+\alpha_2 X_{it}+\varepsilon_{it} \quad (1)$$

$$ISrat_{it}= \beta_0+\beta_1 LM_{it}+\beta_2 X_{it}+\varphi_{it} \quad (2)$$

$$lnC_{it} =\gamma_0+\gamma_1 LM_{it}+\gamma_2 ISrat_{it}+\gamma_3 X_{it}+\mu_{it} \quad (3)$$

Equation (1) is the total effect model of the impact of land transfer marketization on carbon emissions, Equation (2) is the direct effect model of the impact of land transfer marketization on industrial structure optimization and upgrading, and Equation (3) is the impact of land transfer marketization on carbon emissions. The direct impact effect model of the impact. In the model, i and t represent the province and year, respectively, and the explanatory variable Cit represents the carbon emissions of province i in year t; the explanatory variable LM_{it} represents the market-oriented land transfer level of province i in year t; $ISrat_{it}$ is the optimization and upgrading of the industrial structure. level, including rationalization of industrial structure (ISrat1) and Highly industrial organization (ISrat2); X_{it} is a control variable group, including energy structure Enstrit, economic development level $aGDP_{it}$, fiscal expenditure level $bout_{it}$, opening level iet_{it}, and urbanization level urb_{it}. In addition, α_1 is the total effect level of land transfer marketization on carbon emissions, β_1 is the direct effect level of land transfer marketization on the optimization and upgrading of industrial structure, γ_1 is the direct effect of land transfer marketization on carbon emissions, and γ_2 is the industry The direct effect of structural optimization and upgrading on carbon emissions, $\beta_1\gamma_2$ is the size of the mediating effect, and $\alpha_1=\gamma_1+ \beta_1\gamma_2$ is satisfied.

For the test of the mediating effect, the author adopts the stepwise test regression coefficient method.

3.2. Variable Description and Data Source

This paper selects the data of 11 provinces, autonomous regions and municipalities directly under the Central Government in western China from 2011 to 2017 for analysis, including Guangxi Zhuang Autonomous Region, Shaanxi Province, Chongqing City, Sichuan Province, Gansu Province, Guizhou Province, Qinghai Province , Ningxia Hui Autonomous Region, Xinjiang Autonomous Region, Inner Mongolia Autonomous Region, Yunnan Province.

(1) Explained variable

The carbon emission data of eleven provinces, autonomous regions, and municipalities directly under the Central Government in western China from 2007 to 2017 were selected as the explained variables. Logarithmically process the data. The carbon emission data comes from the China Energy Statistical Yearbook.This paper adopts the “Method 1” of IPCC (2006) to calculate CO_2 emissions related to energy activities in China, that is, to estimate CO_2 emissions based on the amount of fuel burned and the carbon emission coefficients of various energy sources. The consumption data of various industries and energy types are all from the "China Statistical Yearbook" and "China Energy Statistical Yearbook" from 2011 to 2017. Since the types of fuel include both raw coal and coke, both crude oil and refined oil, in order to avoid

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double estimation of CO_2 emissions, this paper excludes coal and crude oil consumed by "petroleum processing, coking and nuclear fuel processing industries" from the industry, and uses Coal, crude oil and natural gas as industrial raw materials. The carbon emission calculation formula is $C=\sum C_j=\sum m_j \cdot \delta_j$, where C is the total carbon emission; C_j is the carbon emission of the jth primary energy consumption; m_j is the consumption of the jth primary energy; δ_j is the The carbon emission coefficient of the jth primary energy.

(2) Explanatory variables

The marketization level of land transfer is selected as the explanatory variable. Since the ratio of the market-based transfer price to the average price will deviate from the actual situation due to differences in the economic status quo among cities, the ratio of the total land transfer area to the total land transfer area is chosen as the market-based indicator for land transfer. The data on the marketization of land transfer comes from the China Land Transfer Market Network.

Table 1. Descriptive statistics of main variables

variable name	explanation	sample size	mean	standard deviation	min	max
carbon emission(lnC)	logarithm	77	2.365715	0.2934072	1.643958	2.906335
marketization of land(LM)	The ratio of the auction and listing to the total sale area(%)	77	39.4233	14.16172	4.485914	74.23455
Highly structured industry(ISrat1)	The ratio of the output value of the tertiary industry to the secondary industry(%)	77	1.003924	0.2429397	0.6218638	1.576296
Rationalization of industrial structure(ISrat2)	Theil index	77	0.1407493	0.0372577	0.0774958	0.2273838
energy structure(lnEnstr)	Coal consumption as a percentage of total energy consumption(%), logarithm	77	1.653946	0.2742742	0.811575	1.931966
The level of economic development(lnaGDP)	Average GDP(Yuan / person), logarithm	77	4.564073	0.1437091	4.215188	4.857718
level of fiscal expenditure(lnbout)	General public budget expenditure, logarithm	77	7.481108	0.2385513	6.848749	7.938851
level of opening(lniet)	Total import and export trade, logarithm	77	6.103408	0.5787052	4.653486	6.916762
urbanization level(lnurb)	urbanization rate(%), logarithm	77	1.681696	0.0647994	1.544068	1.806858

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(3) Mediating variable

The optimization of industrial structure is generally measured from two dimensions of industrial structure rationalization and industrial structure heightening [17, 18-19]. The rationalization of industrial institutions and the heightening of industrial institutions are selected as mediating variables. Drawing on the method of Chunhui Gan [17], the rationalization index of industrial structure is Theil index; the calculation formula of Theil index is $E(0) = -1/n\sum\ln(y_i/y)$, where y_i is the i-th index individual income. Referring to the method of Yonghui Han et al.[21], the index of industrial structure improvement is the ratio of the output value of the tertiary industry to the secondary industry. The data on the rationalization of the industrial structure and the high level of the industrial structure come from the China Statistical Yearbook.

(4) Control variables

In addition to core variables, there are many factors that affect carbon emissions in reality. In order to more accurately measure the impact of land transfer marketization on carbon emissions, the author added the following five control variables into the model, namely: (1) Energy structure (Enstr): measured by the proportion of coal consumption in total energy consumption; (2) Economic development level (aGDP): Since urban GTFP is closely related to economic level, it is generally believed that the higher the level of economic development, the higher the corresponding GTFP, which is measured by per capita GDP, and the data is processed by logarithm; (3) The level of fiscal expenditure (bout): The general public budget expenditure is measured, and the data is processed by logarithm; (4) The level of opening to the outside world (iet): the level of interaction between the city and the foreign economy, which can bring advanced technology and management experience to local enterprises and improve their production efficiency, here Measured by the total import and export trade, the data is processed by logarithm; (5) Urbanization level urb: measured by the urbanization rate of the permanent population. The data come from the statistical yearbooks of various provinces, and the data is processed by logarithm.

The descriptive statistics of the main variables are shown in Table 1.

4. Analysis of Empirical Results

4.1. Stationarity Test

Table 2. Stationarity Test

VARIABLES	Adjusted t*
lnC	-11.6759 ***
LM	-7.0078 ***
ISrat1	-4.1948***
ISrat2	-8.1365***
lnEnstr	-5.9439 ***
lnaGDP	-6.2064***
lnbout	-4.7528***
lniet	-4.6958***
lnurb	-7.5162***

The author studies the panel data model. Panel data can not only reflect the data characteristics of variables in the cross-section, but also express the change rule in time. Before carrying out quantitative analysis, it is necessary to carry out a stationarity test to prevent the pseudo-regression phenomenon that the variables entered are non-stationary series. Through LLC test of variables, it is found that C, LM, ISrat1, ISrat2, Enstr, aGDP, bout, iet, urb and other variable

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sequences have passed the stationarity test, that is, most of the variable sequences of the model are stationary and can be entered into the model to participate in regression . The test results are shown in Table 2.

4.2. Analysis of Mediation Effect

On the basis of controlling other relevant variables, the impact of the marketization of land transfer on carbon emissions in the western region is investigated, and the stepwise regression coefficient method is mainly used to test whether the marketization of land transfer can reduce carbon emissions by improving the optimization and upgrading of the industrial structure. The test results are shown in Table 3.

Table 3. Panel regression results

	Model(1)	Model(2)	Model(3)-1	Model(3)-2	Model(4)
VARIABLES	*lnC*	*lnC*	*ISrat1*	*ISrat2*	*lnC*
LM	.0064446***		-.0039738**	.000572***	.0033402*
ISrat1		-.2594892**			-.2139417*
ISrat2		4.840036***			3.941322***
Enstr	-.1419223	-.0375574***	.0962745	-.0189459**	-.0466532
LnaGDP	3.333597***	3.138274***	-2.458416 ***	-.1253124**	3.301536***
Lnbout	.0132103	.1379097*	.9639076 ***	.0114911	.1741402
Lniet	.1669936**	.1961152***	-.4160093***	-.0195792***	.1551599
urb	-6.976814**	-3.915424 ***	5.380263***	-.2578403**	-4.809519***
Adj-R-squared	0.5675	0.6135	0.5248	0.8230	0.6247

Note: Robust standard errors in parentheses; Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

In Table 3, Model 1 is the total effect model of land grant marketization on carbon emissions, Model 2 is the direct effect model of industrial organization optimization and upgrading on carbon emissions, Model 3 is the direct effect model of land grant marketization on industrial structure optimization and upgrading, and Model 4 is the direct effect model of land grant marketization on carbon emissions. As can be seen from Table 2, the adjusted R2 values of the four models are all greater than 0.5, indicating that the equations fit well. As the regression coefficients of model (3)-1, model (3)-2 and model 4 are all significant, there is a mediating effect.

First, Model 1 and Model 4 show that the regression coefficients of land transfer marketization on carbon emissions in the western region are both positive at the 1% significance level, indicating that land transfer marketization has a significant positive effect on carbon emissions. When the government improves the marketization level of land transfer and increases the proportion of bidding, auction and listing transfer, the province's carbon emissions will also increase accordingly. The model results are contrary to Hypothesis 1. Secondly, Model 2 shows that at the 5% significance level, the regression coefficient of industrial structure heightening on carbon emissions in the western region is negative, indicating that industrial structure heightening has a positive effect on the reduction of carbon emissions, which verifies Hypothesis 2. At the 1% significant level, the regression coefficient of industrial structure rationalization on carbon emissions in the western region is positive, indicating that industrial structure rationalization has a promoting effect on carbon emissions. drive an increase in carbon emissions, contrary to Hypothesis 2.

This is followed by an examination of the mediating effects of marketization of land concessions, industrial organization optimization and carbon emissions.

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Table 4. Sobel test

VARIABLES	β_1	γ_2	$\beta_1 \cdot \gamma_2$ (Indirect effect)	γ_1 (Direct effect)	α_1 (Total effect)
LM(ISrat1)	-20.7064**	.005348 ***	-.11074*	-.275931**	-.38667***
LM(ISrat2)	305.833***	.003971**	1.21436*	4.32539***	5.53975***

It can be seen from Table 4 that under the path of high industrial structure, the direct effect of land transfer marketization on carbon emissions is -0.275931, the indirect effect is -0.11074, and the total effect is -0.38667. The Sobel test P value of the mediation effect is less than 0.1, indicating that the mediation effect is established, and the strength of the mediation effect is 28.64%. It shows that the marketization of land transfer suppresses carbon emissions by promoting the heightening of the industrial structure, and verifies Hypothesis 3.Under the path of rationalization of industrial structure, the direct effect of marketization of land transfer on carbon emissions is 0.432539, the indirect effect is 0.121436, and the total effect is 0.553975. The Sobel test P value of the mediation effect is less than 0.1, indicating that the mediation effect is established, and the strength of the mediation effect is 21.92%.It shows that the marketization of land transfer promotes carbon emission by promoting the rationalization of industrial structure, and verifies hypothesis 4.Whether the marketization of land transfer can ultimately reduce carbon emissions by promoting the optimization and upgrading of industrial institutions depends on the superposition of the negative effect through the rationalization of the industrial structure and the positive effect through the heightening of the industrial structure. In the end, the rationalization of the industrial structure has a greater impact than the heightening of the industrial structure. Therefore, the marketization of land transfer promotes carbon emissions to a certain extent through the optimization and upgrading of the industrial structure.

4.3. Robustness Check

In order to ensure the robustness of the study results, this paper re-measures the marketization of land concessions using the ratio of auctioned concessions to the total number of concessions in the western region (excluding the Tibet Autonomous Region) from 2011-2017, and the test results are shown in Table 5. the robustness results again indicate that the marketization of land concessions has a positive contribution to carbon emissions by promoting the optimization and upgrading of industrial institutions.

Table 5. Robustness check

	Model(5)	Model(6)	Model(7)-1	Model(7)-2	Model(8)
VARIABLES	*lnC*	*lnC*	*ISrat1*	*ISrat2*	*lnC*
LM	0.0002039		-.0017355***	.0000798**	0.0014613***
ISrat1		-0.2594892**			-0.4785783***
ISrat2		4.840036***			5.346355***
Enstr	-0.1890339	-0.0375574	-0.0307785	-0.0149129	-0.1240339
lnaGDP	2.757899***	3.138274***	-3.712957***	-0.0917122	1.471284*
lnbout	-0.1306306	0.1379097	1.292033***	-0.0138735	0.5618814**
lniet	0.2612662***	0.1961152**	-0.5544898***	-0.0069845	0.0332413
lnurb	-5.598568***	-3.915424***	7.829732***	-0.3091317**	-0.1987001
Adj-R-squared	0.5920	0.6135	0.6251	0.7983	0.6588

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5. Conclusion

This paper selects 11 provinces, autonomous regions, and municipalities directly under the Central Government except the Tibet Autonomous Region in the western region as the research area, and uses the mediation effect model to investigate the impact degree and mechanism of land transfer marketization on carbon emissions through industrial structure optimization and upgrading, and draw the following conclusions:

(1) The marketization of land transfer leads to the reverse development of the rationalization of the industrial structure, thereby promoting the increase of provincial carbon emissions. The market-oriented allocation of urban land will lead the corresponding industrial sectors to pay more attention to the scale of output and economic performance. This process will cause problems such as overuse of resources and environmental degradation, thereby inhibiting the increase of carbon emissions.

(2) The marketization of land transfer will suppress the increase of carbon emissions by promoting the development of a highly sophisticated industrial structure. The promotion of the marketization of land transfer will guide the relevant industries to update production technology and promote the transformation and upgrading of the industrial structure. Reduction has a positive effect.

In summary, this paper proposes the following policy recommendations. (1) In the process of urban land system reform, local governments should continue to adhere to the market-oriented land transfer system, continuously expand the scope of urban land market-oriented transfers, standardize bidding, auction and listing transfers, and limit the scale and proportion of transfers by agreement. , increase the transparency of the operation of the primary land market, reduce rent-seeking space and corruption in the process of land supply, encourage high-quality investment projects to acquire land through market-oriented methods, and give full play to the decisive role of the market mechanism in the allocation of land elements to achieve urbanization. Steady economic growth and sustainable use of the ecological environment. (2) It is necessary to give full play to the government's guiding and regulating role in macroeconomic operation. For environmental protection industries, the government should increase the support and preferential policies to reduce the capital outflow of the industry; for traditional industrial enterprises, the local government should make reasonable layout and planning according to the local economic development level and industrial characteristics, and actively guide industrial transformation and industrial transformation. Upgrade, pay attention to the ecological and environmental protection issues in the process of economic development, and achieve a win-win situation between economic development and environmental protection.

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