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Environmental Impact of Capital Expansion Under Economic Imbalance: Evidence from China

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Abstract

At present, along with China's booming economic development, environmental pollution is increasing. This paper first uses the entropy weight method to calculate the comprehensive indicators of environmental pollution, takes 30 provinces in China (except Tibet) as the research object and uses the provincial panel data covering the years 2000-2015, to explores the impact of capital expansion on environmental pollution under the condition of unbalanced economic development in China. The results show that the more serious the unbalanced growth of sectoral economy is, the more distorted China's capital expansion will be, and distorted capital expansion will further aggravate environmental pollution. Finally, based on the empirical research results of this paper, the policy recommendations for improving the environment are proposed from the perspective of capital expansion.

Keywords: Economic Disequilibrium; Capital Expansion; Environmental Pollution

1 INTRODUCTION

At present, along with China's booming economic development, environmental pollution is increasing. According to the data of China Environmental Status Bulletin 2017, there are 239 cities with serious air pollution in China, and only 90 cities have reached the target. At the same time, the frequency of environmental pollution in various cities in China is relatively high. In 2017, a total of 2311 days of environmental pollution occurred nationwide. In general, China's vigorous economic development is accompanied by an increase in environmental pollution. Especially in the late 1990s, the economic growth was driven by a large number of input factors and the sacrifice of the environment, the extensive economic growth mode has further aggravated environmental pollution speed. Therefore, besides China’s economic development, more attention should be paid to the problems arising in the process of economic development. Among them, the imbalance of sectoral economic development is an important issue of China's economic development. Taking the urban-rural development differentiation and the development gap in the eastern, central and western regions as an example, the gap between the rich and the poor in China's economic development is still very serious. The unbalanced growth of sector economy directly restricts the sustainable development of China's economy and distorts China's capital market system to a certain extent, thus accelerating the rapid expansion of capital, while the efficiency of capital production begins to decline. The inefficient capital expansion may aggravate environmental deterioration through factors such as resource mismatch, industrial structure, enterprise productivity, and energy efficiency. Therefore, clarifying the relationship between the current special economic development mode and environmental pollution is of great significance for formulating reasonable policies and improving the severe situation of serious environmental degradation.

2 LITERATURE REVIEW

According to academic research on environmental pollution, there are mainly two types of factors that affect the environmental pollution. First, it is an internal factor of a country, which mainly includes the internal industrial structure of the country, the development trend of technology, the severity of environmental protection policies and regulations, and administrative corruption and urbanization. The external factors of the country are mainly the degree of trade openness and foreign investment. Lamla[1] believes that industrial output share, fertilizer use, unit energy consumption, social corruption, education level, and capitalization and socialization are important factors influencing air pollution and water pollution. For the factors of trade openness, Dean et al.[2] analyzed the impact of China's free trade on the water environment, and the result is that the structural effect of free trade has an adverse impact on the environment, and the technical effect is conducive to reducing the level of water pollution, and with the increase of income, the effect of technological effect is obviously greater than the structural effect, so it is concluded that trade liberalization will be conducive to the decline of water pollution level. For the impact of industrial restructuring on environmental pollution, Oosterhaven et al.[3] pointed out that the optimization of industrial structure will have a significant positive effect on the quality of the ecological environment. Janicke[4] pointed out that in different countries, the gradual transformation of industrial structure will have different impacts on the environmental level.

In summary, firstly, there are abundant research results on the influencing factors of environmental pollution by scholars, the researchers are mainly focused on foreign investment, industrial structure, economic growth, investment in scientific research, environmental planning and other influencing factors, while there are few studies from the perspective of capital expansion. Secondly, some scholars have studied the impact of unbalanced regional development on environmental pollution, but they have not linked unbalanced development with capital expansion, revealed its internal relationship, and further studied its impact on environmental pollution. In fact, the unbalanced economic development has led to distorted factor prices, further distorted China's capital market to a certain extent, accelerated the inefficient expansion of capital, and inefficient capital expansion may further aggravate environmental deterioration through resource mismatch, industrial structure, enterprise productivity, energy utilization, and other factors.

Therefore, the main contributions of this paper are as follows: Firstly, on the basis of the existing research, the relationship between economic unbalanced development and capital expansion is studied, and then the impact of economic unbalanced development on environmental pollution is further studied, which is an innovative point in the study of influencing factors of environmental pollution; Secondly, this paper adopts the entropy weight method to construct environmental pollution comprehensive index to measure the environment level in each province from the four indicators of industrial waste water discharge, industrial SO2 emissions, industrial soot, and dust emissions and industrial solid waste production. The advantage of this method is that it takes into account the relationship between the indicators and makes the calculation of environmental pollution more comprehensive, avoiding the subjectivity of a single indicator.

3 METHODOLOGY AND DATA DESCRIPTION

3.1 Econometric Model

In order to test the impact of unbalanced development of sector economy on capital expansion and its further impact on environmental pollution, this paper sets the panel data measurement model as follows: the first step model is used to verify the fact that China's capital expansion is growing rapidly under unbalanced development of sector economy, and the second step model uses capital expansion as the core variable to test the impact of rapid growth in capital expansion on environmental pollution.

$$Cap_{it}=C_1+\beta_1\times Bal_{it}+\beta_2\times SIP_{it}+\beta_3\times TIP_{it}+\beta_4\times POP_{it}+\beta_5\times EGR_{it}+\beta_6\times EOL_{it}+\mu \qquad (1)$$

$$P_{it}=C_2+\gamma_1\times Cap_{it}+\gamma_2\times SIP_{it}+\gamma_3\times TIP_{it}+\gamma_4\times POP_{it}+\gamma_5\times EGR_{it}+\gamma_6\times EOL_{it}+\varepsilon \qquad (2)$$

Where subscripts i and t represent the ith core explanatory variable and year respectively, $\beta_1 \sim \beta_6$ represent the regression coefficients of each influencing factor， μ is an unobservable time effect, which is used to explain the interference of other random factors not included in the econometric model.

In the first step model, Cap is the explanatory variable, indicating the degree of capital expansion in each province, and Bal is the main explanatory variable，indicating the degree of unbalanced economic development among department, which is represented by the proportion of rural output to total output of each province and that of state-owned enterprises to total output of all enterprises in this paper. The rest is a series of control variables. In the second step model, P is the degree of environmental pollution in each province. Cap, as the core explanatory variable, still represents a capital expansion in each province.

3.2 Description of Variables

The meaning and the description of the variables are as follows:

TABLE1 DESCRIPTION OF VARIABLES

Variables	**Meaning**	**Description**
P	Degree of environmental pollution	Calculated by entropy weight method
Cap	Degree of capital expansion	Fixed capital investment
Bal1	Unbalanced development between urban and rural areas	The proportion of rural output to total output
Bal2	Unbalanced development between state-owned enterprises and non-state-owned enterprises	The proportion of state-owned enterprise output to all enterprise output
SIP	Industrial structure	The proportion of secondary industry output value to gdp
TIP	Industrial structure	The proportion of tertiary industry output value to gdp
POP	Population	Total population at year end
EGR	Economic growth rate	Calculated by gdp
EOL	Degree of economic openness	Total volume of imports and exports as a percentage of gdp

When calculating the total volume of imports and exports, the amount of import and export trade needs to be converted from US dollar to RMB, which is converted according to the annual exchange rate in this paper.

In terms of data sources, due to the lack of data in Tibet, this paper uses the panel data of 30 provincial administrative regions except for Tibet, covering the period 2000-2015. All data are from the China Statistical Yearbook and China Environmental Yearbook. Some missing data are supplemented by the China Environmental Protection Database.

The descriptive statistics of each variable are as follows:

TABLE 2 SUMMARY STATISTICS

Variables	**Mean**	**std**	**Maximum**	**Minimum**
P	1.4724	0.2	1.9986	1.0015
Cap	0.5718	0.2199	1.3283	0.2529
Bal1	0.1265	0.0658	0.3645	0.0045
Bal2	0.3056	0.1748	0.8214	0.013
SIP	0.4912	0.1944	1.6086	0.1974
TIP	0.4141	0.0788	0.7965	0.283
POP	4366.5	2633.9	10849	517
EGR	0.1139	0.0258	0.238	0.03
EOL	0.3097	0.3582	1.6682	0.0152

3.3 Calculation Method of Environmental Pollution Indicators

With regard to the measurement of environmental pollution degree in each province, this paper draws on the practice of Li Shuai et al.[5] and uses the entropy weight method to construct a comprehensive index of environmental pollution. The entropy weight method is an objective weighting method used to measure information theory in information theory, which considers the influence relationship between the indicators and makes the calculation of environmental pollution more comprehensive, avoiding the subjectivity caused by using the single indicator to measure the level of environmental pollution.

Therefore, this paper first selects four kinds of environmental pollution measurement indicators, including per capita industrial wastewater discharge, per capita industrial sulfur dioxide discharge, per capita industrial dust and dust discharge and per capita industrial solid waste discharge, and then calculates the comprehensive environmental pollution index by using the entropy weight method. The calculation can be divided into the following six steps:

The first step is to standardize the original data of four environmental pollution indicators.

$$\mathrm{P}_{ij}^{''} = \frac{X_{ij} - Min(X_{ij})}{Max(X_{ij}) - Min(X_{ij})} \tag{3}$$

Among them, Xij denotes the value of the jth index of the its province (i=1,2,3,...,m; j=1,2,3,…,n)

The second step is to translate the standardized data obtained in the first step:

$$P_{ij}^{'} = P_{ij}^{''} + 1 \tag{4}$$

The third step is to calculate the proportion of the jth indicator:

$$\mathbf{P}_{ij} = \frac{P_{ij}^{'}}{\sum_{i=1}^{m} P_{ij}^{''}} \tag{5}$$

The fourth step is to calculate the entropy value EJ and the coefficient of variation gj of the jth environmental indicator:

$$e_j = -\frac{1}{\ln m}\sum_{i=1}^{m} P_{ij} \ln P_{ij} \tag{6}$$

$$g_i = 1 - e_i \tag{7}$$

The fifth step is to calculate the weight of the jth environmental indicator in the comprehensive index of environmental pollution:

$$W_j = \frac{g_j}{\sum_{j=1}^{n} g_j} \tag{8}$$

The sixth step is to calculate the comprehensive index of environmental pollution:

$$E_i = \sum_{j=1}^{n} W_j P_{ij} \tag{9}$$

Ei represents the comprehensive index of environmental pollution in the ith province. The greater the Ei value, the more serious the environmental pollution in this province is.

4 MODEL ESTIMATION AND EMPIRICAL RESULTS

4.1 EMPIRICAL RESULTS

For the panel data model, the fixed effect model can separate the constant relative to the observed object or its fixed constant to reflect the interface difference or time trend, since the panel data is used in this paper, this paper first uses the fixed effect model to analyze. To overcome the endogeneity, many scholars use two-stage least squares (2SLS) or three-stage least squares (3SLS) to estimate the simultaneous equation model. Aiello & Cardanmone (2009) uses three-stage least squares (3SLS), but in the case of missing variables, IT3SLS can make the estimation results consistent (Berndt & Wood, 1975). Therefore, the paper estimates by least squares (OLS), two-stage least squares (2SLS), three-stage least squares (3SLS) and iterative three-stage least squares (IT3SLS).

TABLE 3 ECONOMETRIC RESULTS

	OLS		2SLS		3SLS		IT3SLS	
VARIABLES	**Cap**	**P**	**Cap**	**P**	**Cap**	**P**	**Cap**	**P**
Bal1	-0.100***		-0.100***		-0.100***		-0.100***	
	(0.0339)		(0.0339)		(0.0336)		(0.0336)	
SIP	0.147**	0.00515	0.147**	-0.0526	0.147**	-0.0526	0.147**	-0.0526
	(0.0745)	(0.0245)	(0.0745)	(0.0478)	(0.0739)	(0.0475)	(0.0739)	(0.0475)
TIP	-0.520***	-0.0834	-0.520***	-0.0511	-0.520***	-0.0511	-0.520***	-0.0511
	(0.187)	(0.0520)	(0.187)	(0.0641)	(0.185)	(0.0636)	(0.185)	(0.0636)
POP	-0.0853**	0.0219**	-0.0853**	0.0384**	-0.0853**	0.0384**	-0.0853**	0.0384***
	(0.0233)	(0.00881)	(0.0233)	(0.0150)	(0.0231)	(0.0149)	(0.0231)	(0.0149)
EGR	0.172**	0.107***	0.172**	0.0637	0.172**	0.0637	0.172**	0.0637
	(0.0745)	(0.0282)	(0.0745)	(0.0436)	(0.0739)	(0.0432)	(0.0739)	(0.0432)
EOL	-0.143***	0.0220***	-0.143***	0.0469**	-0.143***	0.0469**	-0.143***	0.0469**
	(0.0210)	(0.00722)	(0.0210)	(0.0186)	(0.0209)	(0.0185)	(0.0209)	(0.0185)
Cap		0.165***		0.386***		0.386***		0.386***
		(0.0178)		(0.149)		(0.148)		(0.148)
Constant	6.235***	-0.486	6.235***	-1.358**	6.235***	-1.358**	6.235***	-1.358**
	(1.117)	(0.312)	(1.117)	(0.685)	(1.108)	(0.679)	(1.108)	(0.679)
Observations	450	450	450	450	450	450	450	450
R-squared	0.248	0.253	0.248	-0.008	0.248	-0.008	0.248	-0.008

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

TABLE 4 ECONOMETRIC RESULTS

	OLS		2SLS		3SLS		IT3SLS	
VARIABLES	**Cap**	**P**	**Cap**	**P**	**Cap**	**P**	**Cap**	**P**
Bal2	-0.236***		-0.236***		-0.236***		-0.236***	
	(0.0224)		(0.0224)		(0.0222)		(0.0222)	
SIP	0.145**	0.00515	0.145**	-0.00916	0.145**	-0.00916	0.145**	-0.00916
	(0.0584)	(0.0245)	(0.0584)	(0.0265)	(0.0580)	(0.0263)	(0.0580)	(0.0263)
TIP	-0.195	-0.0834	-0.195	-0.0754	-0.195	-0.0754	-0.195	-0.0754
	(0.124)	(0.0520)	(0.124)	(0.0528)	(0.123)	(0.0524)	(0.123)	(0.0524)
POP	-0.139***	0.0219**	-0.139***	0.0260***	-0.139***	0.0260***	-0.139***	0.0260***
	(0.0217)	(0.00881)	(0.0217)	(0.00930)	(0.0215)	(0.00922)	(0.0215)	(0.00922)
EGR	0.228***	0.107***	0.228***	0.0961***	0.228***	0.0961***	0.228***	0.0961***
	(0.0670)	(0.0282)	(0.0670)	(0.0294)	(0.0664)	(0.0292)	(0.0664)	(0.0292)
EOL	-0.177***	0.0220***	-0.177***	0.0281***	-0.177***	0.0281***	-0.177***	0.0281***
	(0.0176)	(0.00722)	(0.0176)	(0.00834)	(0.0175)	(0.00827)	(0.0175)	(0.00827)
Cap		0.165***		0.220***		0.220***		0.220***
		(0.0178)		(0.0401)		(0.0398)		(0.0398)
Constant	4.886***	-0.486	4.886***	-0.702**	4.886***	-0.702**	4.886***	-0.702**
	(0.730)	(0.312)	(0.730)	(0.345)	(0.724)	(0.343)	(0.724)	(0.343)
Observations	450	450	450	450	450	450	450	450
R-squared	0.388	0.253	0.388	0.237	0.388	0.237	0.388	0.237

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

Tables 3 and 4 respectively show the estimation of the model parameters when the core variable is the proportion of rural output to total output and the output of state-owned enterprises accounts for the proportion of the output of all enterprises. Regression results show that no matter what regression method is adopted, the coefficient symbols of the core explanatory variables of the first stage regression model are negative, and the coefficient values are not significantly different, and they are all 1% significant, thus showing that the estimation results are robust and credible. The degree of capital expansion in China is significantly related to the specific mode of dual economic growth and increases with the decrease of the proportion of rural output to total output and that of state-owned enterprises to all types of enterprises in recent years. Therefore, it can be concluded that the smaller the proportion of the output of backward sectors, the higher the degree of capital expansion in China, that is, the more serious the unbalanced growth of the inter-sector economy is, the higher the degree of capital expansion in China. At the same time, the coefficients of most control variables are also significant, which indicates that the development of secondary and tertiary industries has greatly promoted the industrial transfer in developed countries and regions, thus enabling the rapid expansion of capital. For the second stage regression model, the coefficients of core variable capital expansion degree that are estimated by 2SLS, 3SLS and IT3SLS are very close and slightly different from those of OLS, but the coefficients are all positive and significant at 1% level, which leads to the conclusion that capital expansion can affect environmental pollution. And the higher the degree of capital expansion, the more serious the level of environmental pollution.

China has a vast territory and the imbalance of the eastern, central and Western economies make the development of different regions different. Therefore, this paper further studies at the eastern, central and western levels of China, and explores the impact of the unbalanced development of sector economy on capital expansion and its further impact on environmental pollution. From the above research, the IT3SLS method is more accurate, so the IT3SLS method is adopted for further estimation.

TABLE 5 ECONOMETRIC RESULTS OF EASTERN, CENTRAL AND WESTERN REGIONS

	Eastern		**Central**		**Western**	
VARIABLES	**Cap**	**P**	**Cap**	**P**	**Cap**	**P**
Bal1	0.137**		1.253***		-0.589***	
	(0.0591)		(0.257)		(0.0922)	
SIP	1.183***	-0.427*	6.543***	0.0647	-0.0500	-0.120**
	(0.251)	(0.259)	(0.924)	(0.180)	(0.0873)	(0.0493)
TIP	1.199***	-0.311*	4.761***	-0.163	-0.253	-0.375**
	(0.433)	(0.181)	(0.799)	(0.160)	(0.280)	(0.158)
POP	-0.135***	0.0692	0.00572	0.0184	-0.0320	0.00845
	(0.0384)	(0.0451)	(0.0753)	(0.0251)	(0.0369)	(0.0220)
EGR	0.0979	0.0646	-0.0134	0.0210	0.0969	0.126
	(0.116)	(0.0887)	(0.111)	(0.0367)	(0.139)	(0.0835)
EOL	-0.235***	0.172**	-0.117	0.0439	-0.0481	-0.0938***
	(0.0437)	(0.0789)	(0.0812)	(0.0274)	(0.0434)	(0.0253)
Cap		0.0722**		0.241***		0.595***
		(0.317)		(0.0681)		(0.0888)
Constant	-3.677	-0.972	-41.57***	-0.534	6.926***	0.850
	(2.530)	(1.014)	(6.981)	(1.144)	(1.516)	(0.897)
Observations	181	181	134	134	135	135
R-squared	0.244	-2.019	0.439	0.516	0.391	0.267

TABLE 6 ECONOMETRIC RESULTS OF EASTERN, CENTRAL AND WESTERN REGIONS

	Eastern		Central		Western	
VARIABLES	**Cap**	**P**	**Cap**	**P**	**Cap**	**P**
Bal2	0.173***		0.438***		-0.252***	
	(0.0294)		(0.0465)		(0.0494)	
SIP	0.482***	0.0359	1.485***	0.121	0.0387	-0.123**
	(0.153)	(0.0772)	(0.252)	(0.133)	(0.0909)	(0.0595)
TIP	0.112	-0.113	1.395***	-0.128	0.0257	-0.353*
	(0.194)	(0.0794)	(0.331)	(0.142)	(0.292)	(0.191)
POP	-0.159***	-0.00240	0.245***	0.0195	-0.129***	0.0332
	(0.0355)	(0.0159)	(0.0664)	(0.0249)	(0.0371)	(0.0275)
EGR	0.216*	0.113***	0.0372	0.0245	0.509***	-0.00270
	(0.110)	(0.0434)	(0.0904)	(0.0358)	(0.126)	(0.108)
EOL	-0.264***	0.0277	0.0888	0.0420	-0.150***	-0.0777**
	(0.0411)	(0.0225)	(0.0703)	(0.0270)	(0.0481)	(0.0309)
Cap		0.0879		0.216***		0.535***
		(0.0683)		(0.0418)		(0.128)
Constant	3.087***	-0.0300	-9.777***	-0.790	3.707**	-0.124
	(1.165)	(0.465)	(2.303)	(1.001)	(1.514)	(1.120)
Observations	181	181	134	134	135	135
R-squared	0.345	0.230	0.602	0.519	0.335	-0.069

Tables 5 and 6 show the results of estimating the eastern, central and western regions by using IT3SLS. The results show that there are regional differences in the impacts of unbalanced sectoral economic development on capital expansion. For the eastern and central regions, the coefficients of the core explanatory variables Bal1 and Bal2 are positive and significant at the level of 1%. Thus, in the eastern and central regions, when the output proportion of backward sectors is smaller, the degree of capital expansion also decreases. For the western region, the coefficient symbols of the core explanatory variables Bal1 and Bal2 are negative and significant at the level of 1%. It is concluded that the smaller the proportion of the output of backward sectors in the western region, the higher the degree of capital expansion is. That is to say, for the western region, the more serious the unbalanced growth of the inter-sector economy, the higher the degree of capital expansion. This also confirms that in order to catch up with the economic gap between developed regions as soon as possible and to meet the performance needs of local governments, the relatively backward regions tend to be more inclined to pursue technology and capital-intensive industries than developed regions.

The second stage regression results show that in the eastern, central and western regions, the coefficients of the core explanatory variable Cap are positive, and the coefficients of the eastern region are significant at 5%, while those of the central and western regions are significant at 1%. This shows that capital expansion has a significant impact on environmental pollution in the eastern, central and western regions, and the higher the degree of capital expansion, the more serious environmental pollution is. However, due to the large difference of coefficient values among the three regions, it shows that the degree of impact of capital expansion on environmental pollution is different in the eastern, central and Western regions. In the eastern region, the increase of 1% of capital expansion will lead to an increase of environmental pollution level by about 0.08%. In the central region, the increase of 1% of capital expansion will lead to an increase of environmental pollution level by about 0.2%. In the western region, the degree of capital expansion will lead to the increase of environmental pollution level by about 0 Every 1% increase will lead to an increase of nearly 0.6% in the level of environmental pollution. It can be seen that the impact of capital expansion on environmental pollution in the east, central and western regions is increasing in turn, especially significant in the western region. This is related to more policy support and environmental regulation in the eastern region.

4.2 Regression Robustness Test

Since regression models may miss variables and cause endogeneity problems, we use tool variables to further test regression results in order to test the robustness of empirical research results. Referring to the practice of Gao Chuanlun[6], we do a lagging one-stage treatment of the core explanatory variables in the regression equation. The lag term is related to the current variable and is independent of the error term, so it does not affect the dependent variable and can be used as a tool variable.

TABLE 7 ROBUSTNESS TEST

VARIABLES	**Cap**	**P**	**Cap**	**P**
lagBal1	-0.101***			
	(0.0333)			
SIP	0.104	0.0118	0.117*	0.00181
	(0.0754)	(0.0251)	(0.0605)	(0.0252)
TIP	-0.654***	-0.115**	-0.313**	-0.106**
	(0.184)	(0.0525)	(0.126)	(0.0527)
POP	-0.0915***	0.0210**	-0.137***	0.0245***
	(0.0230)	(0.00889)	(0.0219)	(0.00892)
EGR	0.0305	0.107***	0.0834	0.106***
	(0.0737)	(0.0283)	(0.0683)	(0.0284)
EOL	-0.145***	0.0192***	-0.172***	0.0231***
	(0.0205)	(0.00714)	(0.0178)	(0.00716)
lagCap		0.163***		0.204***
		(0.0187)		(0.0187)
lagBal2			-0.212***	
			(0.0233)	
Constant	7.330***	-0.364	5.828***	-0.557*
	(1.106)	(0.323)	(0.753)	(0.324)
Observations	420	420	420	420
R-squared	0.270	0.264	0.374	0.259

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

The robustness test of the results of the first step econometric model in Table 6 shows that when the lag term of capital expansion is used as the explanatory variable, the coefficients of the core explanatory variables in the regression model are still negative, and both are significant at the level of 1% significance. At the same time, the coefficient values are not significantly different from the basic model. When a series of control variables were added, the coefficient symbols of the core explanatory variables remained unchanged, and the proportion of rural output was significant at 5% significant level, while that of state-owned enterprises is still significant at 1% significant level.

The robustness test of the results of the second step econometric model in Table 6 shows that when the lag term of environmental pollution is taken as the explanatory variable and the capital expansion as the explanatory variable, the coefficient symbol of the explanatory variable is still positive and significant at the 1% significance level, and the coefficient value does not significantly deviate from the original model. When the control variables are gradually increased, the coefficients change little and remain significant. Therefore, there is no significant difference between the results of the re-test using the lag term of the core explanatory variables and the basic model, and the test results still support the conclusion.

5 CONCLUSIONS AND POLICY RECOMMENDATIONS

Through the theoretical analysis, the results show that the more serious the unbalanced growth of sectoral economy is, the more distorted China's capital expansion will be, and distorted capital expansion will further aggravate environmental pollution, and the higher the degree of capital expansion is, the more serious the environmental pollution level will be.

Based on the results of this paper, some suggestions are put forward to improve the environmental level. From the perspective of improving the sectoral economic development system, to replace non-equilibrium biased policies with equal and fair competition as criteria, strengthen economic support and environmental governance in the central and Western regions, improve the factor market system and perfect the factor market reform as well as change the single assessment method for local governments are all fundamental way to solve the problem. From the perspective of capital expansion, to increase capital productivity, accelerate the market mechanism reform, reduce barriers to factor flow, strengthen market role, promote the flow of various factor resources through factor market integration, and obtain higher resource allocation efficiency are the fundamental way to solve the problem of inefficient capital expansion. Through economic support and environmental governance, it is possible to improve environmental quality and achieve environmentally sustainable development while reducing distortions in capital expansion.

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REFERENCE

[1] Lamla M J. Long-run determinants of pollution: a robustness analysis[J]. Ecological Economics, 2009, 69(1):135-144.

[2] Dean J M, Lovely ME, Wang H. Foreign Direct Investment and Pollution Havens: Evaluating the Evidence from China [M]. Office of Economics, US international Trade Commission, 2003.

[3] Oosterhaven J, Broersma L. Sector structure and cluster economies: adecomposition of regional labour productivity[J]. Regional Studies, 2007,41(5): 639-659

[4] Janicke M. "Green growth": from agrowing eco-industry to economic sustainability[J]. Energy Policy, 2012(48):13-21

[5] Li Shuai, Wei Hong, Ni Xilu, Gu Yanwen, Li Changxiao. Urban Human Settlement Environmental Quality Assessment in Ningxia Based on Analytic Hierarchy Process and Entropy Weight Method [J]. Journal of Applied Ecology, 2014, 25 (09): 2700-2708.

[6] Gao Chuanlun. Economic Growth Effect of Capital Market Segmentation and Capital Expansion in China [J]. Business Research, 2017 (8): 27-34

[7] Copeland B and Taylor M. Trade, growth and the environment[J].Journal of Economic Literature,2004,42(1):7-71

[8] Shaw R, The impact of population growth on environment: the debate heats up[J]. Environmental Impact Assessment Review, 1992, 12(1):11

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