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Research on the Evaluation and Improvement Paths of Fiscal Environmental Protection Expenditure Efficiency under the "Double Carbon" Vision

Zheng Zhang

School of Finance and Public Administration, Anhui University of Finance and Economics. Bengbu, China

Abstract: Government financial investment in environmental protection is an important material guarantee to support green development. It has the dual functions of promoting economic transformation and protecting resources and the environment. It is of great practical significance in promoting China's economy to move towards a high-quality development track. Based on the fiscal environmental protection expenditure data of 31 provinces in China from 2013 to 2022, the article constructs a DEA-BCC model to measure the efficiency of fiscal environmental protection expenditure in each region. It further constructs a restricted dependent variable Tobit model to empirically test the influencing factors, and proposes to improve fiscal environmental protection expenditure. Diversified paths for environmental protection expenditure efficiency in order to achieve high-quality economic development.

Keywords: Fiscal Environmental Protection Expenditure Efficiency; DEA-Tobit Model; Influencing Factors; Improvement Path.

1. Introduction

In the construction of ecological civilization in the new era, the strategic goal of carbon peak carbon neutrality has put forward higher requirements for ecological protection and green and low-carbon development in various places. However, the current national environmental situation is still not optimistic. The backlog of environmental pollution problems caused by long-term rapid economic development and expanding population is still severe. It is necessary to further promote the green transformation of economic and social development and achieve a comprehensive improvement of the ecological environment. In our country, local governments have always played an important role in promoting pollution prevention and ecological environment protection. On the one hand, we regulate the environmental pollution behavior of enterprises by formulating strong environmental protection policies; on the other hand, we use fiscal environmental protection funds to increase investment and construction of environmental protection infrastructure, give full play to its public goods supply function, and highlight the ecological and environmental issues. Comprehensive renovation. Statistics show that the scale of my country's fiscal environmental protection expenditures has been increasing year by year. However, have large-scale financial funds truly played a leveraging role and effectively promoted the improvement of the ecological environment and the development of green economy in various regions? Will differences in economic development, industrial structure, and population size among different regions have an impact on the efficiency of their fiscal environmental protection expenditures? These are issues worthy of further exploration.

Based on the above background, this article attempts to use the DEA-Tobit model to analyze the efficiency level of fiscal environmental protection expenditures in 31 provinces in China from 2013 to 2022, deeply explore the impact of multiple factors on the efficiency of fiscal environmental protection expenditures, and put forward corresponding suggestions accordingly, with a view to formulating scientific , provide reference for sound financial decision-making.

2. Literature Review

Domestic and foreign research on fiscal environmental protection expenditures mainly focuses on the scale and structure of government expenditures, the efficiency and effectiveness of fund use, and the environmental protection expenditure system. Lu Hongyou and Qi Yu (2012) found that environmental protection fiscal expenditures are in a weak position in the entire public fiscal expenditure system in terms of both absolute and relative scales, which makes environmental protection expenditures unable to better achieve equality of basic environmental public services. change. Tan Jianli (2016) believes that whether the scale of fiscal expenditure is reasonable will directly affect the structure of the allocation of public resources between local finance and the market. The scale of fiscal expenditure will have a negative impact on environmental protection issues by changing local fiscal systems and corporate operating activities.

Before the "double carbon" goal was proposed, scholars studied energy conservation and environmental protection expenditures, which mostly used pollutants as output, and analyzed the efficiency or economic effects of fiscal environmental protection expenditures. Research methods are mainly divided into two categories: Zhu Hao (2014) and Kou Tiejun (2019) used DEA, SBM and other methods to build models to measure expenditure efficiency. Bernauer and Koubi (2006) studied the relationship between the scale of fiscal expenditure and environmental quality in 42 countries from 1971 to 1996 and found that the higher the proportion of government expenditure in GDP, the more serious the pollution problem. López et al. (2011) simulated and evaluated the impact of the new fiscal expenditure model on environmental pollution, and predicted the reallocation of fiscal expenditure structure to public goods to reduce

environmental pollution. Zhang Yingying et al. (2020) conducted an empirical analysis on the tax and economic effects of fiscal energy conservation and environmental protection expenditures through data from 263 prefecture-level cities in the eastern, central and western regions from 2013 to 2017, and found that only energy conservation and environmental protection expenditures in the western region have tax effects and energy conservation in the eastern region has a tax effect. Environmental protection expenditures have economic effects, which shows that the tax and economic effects of local fiscal energy conservation and environmental protection expenditures are not significant or have little effect, which directly leads to the lack of local government energy conservation and environmental protection expenditures.

After calculating the efficiency of energy conservation and environmental protection expenditures, many scholars usually explore the influencing factors behind it, that is, what affects the efficiency of fiscal environmental protection expenditures. Some scholars believe that the main factor affecting the effectiveness of energy conservation and environmental protection expenditures is the degree of government decentralization, that is, the division of powers and responsibilities between the central government and local governments and the allocation of environmental protection transfer payments. Tang Yizhuang (2017) believes that the increase in the level of decentralization in government fiscal expenditure has the effect of reducing pollutant emissions.

At present, scholars at home and abroad are paying attention to the effectiveness of fiscal expenditures in various fields of government, and have established a relatively complete theoretical system. However, in terms of fiscal energy-saving and environmental protection expenditures, there are many classification subjects and a wide range of impacts. Moreover, it was relatively late for the government to independently become a new type of fiscal expenditure subject. Therefore, there are some differences in the data caliber. Therefore, my country's Research on fiscal energy conservation and environmental protection expenditures and their efficiency has not been broken down. As my country pays more and more attention to environmental issues, domestic scholars are exploring environmental governance policies and policy evaluation methods that are most in line with China's national conditions, based on selective reference to foreign experience. When exploring my country's energy conservation and environmental protection issues, scholars mainly use statistical descriptions of the current status of fiscal energy conservation and environmental protection expenditures and conduct empirical analysis of expenditure efficiency. In terms of efficiency evaluation method selection, whether domestic or foreign, data envelopment analysis is the most traditional method to evaluate the efficiency of fiscal expenditures. Although it is widely used, it also has certain limitations. Therefore, innovation in measurement methods has become an inevitable requirement for truly measuring the efficiency of fiscal expenditure. This article combines the DEA model and the Tobit model to evaluate the efficiency of fiscal energy conservation and environmental protection expenditures in 31 provinces in my country from 2013 to 2022, and then puts forward targeted policy recommendations.

3. Analysis of Fiscal Environmental Protection Expenditure Efficiency and its Influencing Factors

3.1. Research Methods

3.1.1. DEA Model

Data envelopment analysis (DEA) was first proposed by Charnes et al. Under the assumption of constant returns to scale, the CCR model can be used to measure the comprehensive efficiency of fiscal environmental protection expenditures in each province in China. On this basis, the sum of the linear combination coefficients of input and output is limited to 1, and the BCC model is obtained. This model can be used to calculate the technical efficiency (PTE) of each province's fiscal environmental protection expenditure. Defining the ratio of comprehensive efficiency and technical efficiency as scale efficiency (SE), we have:

$$TE=SE\times PTE \tag{1}$$

The measurement object is given in the form of panel data, including I provinces, and it is assumed that each province has M types of inputs and N types of outputs. Let Xim represent the m-th input of province i, and Yin represent the n-th output of province i. The linear programming formula based on input orientation is

$$\text{s.t.}\begin{cases} TE = min_{\theta,\lambda}\theta \\ \sum_{i=1}^{I}\lambda_i x_{im} + is_m = \theta_k x_{km} \\ \sum_{i=1}^{I}\lambda_i y_{in} - os_n = y_{kn} \\ \lambda_i, is_m, os_n \geq 0 \end{cases} \tag{2}$$

$$\text{s.t.}\begin{cases} PTE = min_{\theta,\lambda}\theta \\ \sum_{i=1}^{I}\lambda_i x_{im} + is_m = \theta_k x_{km} \\ \sum_{i=1}^{I}\lambda_i y_{in} - os_n = y_{kn} \\ \sum_{i=1}^{I}\lambda_i = 1 \\ \lambda_i, is_m, os_n \geq 0 \end{cases} \tag{3}$$

In formulas (2) and (3), it represents the weight coefficient of the linear combination of input variables, represents the slack variable of input, and represents the slack variable of output.

3.1.2. Tobit Model

In order to further explore the reasons for the differences in fiscal environmental protection expenditures among various regions and their impact on the efficiency of fiscal environmental protection expenditures, this article will use the restricted dependent variable Tobit model to conduct an empirical test on the factors affecting the efficiency of fiscal environmental protection expenditures. The comprehensive technical efficiency value (TE) of fiscal environmental protection expenditure measured by the DEA method is used as a restricted dependent variable to further study the impact of external factors on fiscal environmental protection expenditure. Since the comprehensive technical efficiency value measured by the DEA model is between (0, 1), this article uses the restricted dependent variable Tobit model and uses Stata17.0 software to conduct regression analysis to analyze the factors that may affect fiscal environmental protection expenditures. After research, the Tobit model established is as follows:

$$TE_{it} = \alpha X_{it} + \beta_i + \varepsilon_{it} \tag{4}$$

Among them, TE_{it} represents the efficiency of fiscal environmental protection expenditure, ε_{it} is the random disturbance term, and X_{it} represents the external factors selected in this article.

3.2. Explanation of Data and Variables

This article selects 31 provincial-level administrative regions in my country as the research object, and selects 2013-2022 as the research interval. The data used are from the "China Statistical Yearbook" and "China Environmental Yearbook" from 2013-2022.

3.2.1. Selection of Efficiency Indicators

In terms of investment, this article uses the scale of fiscal environmental protection expenditures in all provincial administrative regions across the country from 2013 to 2022 as the investment indicator. In terms of output, this article selects the following four output indicators: domestic waste removal volume, representing electricity consumption, artificial afforestation area and forest coverage rate.

3.2.2. Selection of Influencing Factors and Variables

In the study of factors affecting the efficiency of my country's environmental protection fiscal expenditures, this article selects seven variables: urbanization level, marketization level, population size, public participation, fiscal decentralization, economic development level, and industrialization level.

Table 1. Selection of factors influencing efficiency

Classification of influencing factors	Corresponding indicator selection
urbanization level	Urban population as a share of total population
marketization level	1- Fiscal expenditure/Gross National Product
population size	Year-end resident population
public participation	Educational level of employed persons
degree of fiscal decentralization	Fiscal environmental protection expenditure/total fiscal expenditure
The level of economic development	GDP per capita
industrialization level	Gross industrial output/Gross national product

3.3. Evaluation of Efficiency of Fiscal Environmental Protection Expenditures

3.3.1. Comprehensive Technical Efficiency Evaluation

Table 2. Comprehensive technical efficiency of provincial government fiscal environmental protection expenditures in my country from 2013 to 2022

Area/Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2022 Annual scale return
Beijing	0.711	0.752	0.521	0.432	0.432	0.344	0.333	0.227	0.251	0.266	drs
Tianjin	0.831	0.514	0.46	0.376	0.36	0.386	0.445	0.407	0.366	0.52	irs
Hebei	0.468	0.475	0.455	0.565	0.495	0.602	0.44	0.516	0.332	0.437	drs
Shanxi	0.494	0.504	0.467	0.711	0.726	0.972	0.925	0.715	0.658	0.872	drs
Inner Mongolia	0.522	0.446	0.5	0.637	0.657	0.73	0.624	0.744	0.609	0.878	drs
Liaoning	0.872	0.881	0.92	0.91	0.856	1	1	1	1	1	-
Jilin	0.68	0.571	0.386	0.362	0.368	0.491	0.659	0.578	0.6	0.553	drs
Heilongjiang	1	0.815	0.667	0.623	0.501	0.531	0.454	0.543	0.374	0.466	drs
Shanghai	1	1	1	0.961	1	0.779	0.743	0.441	0.41	0.366	drs
Jiangsu	0.355	0.529	0.492	0.474	0.448	0.57	0.591	0.566	0.732	0.584	drs
Zhejiang	1	0.848	1	1	0.992	1	1	0.831	0.943	0.969	drs
Anhui	0.469	0.571	0.412	0.479	0.639	0.713	0.6	0.495	0.387	0.337	drs
Fujian	1	0.956	1	1	1	1	0.897	0.595	0.856	0.917	drs
Jiangxi	1	0.896	0.746	0.699	0.738	0.913	0.836	0.611	0.484	0.476	drs
Shandong	0.797	0.77	0.673	0.663	0.532	0.796	0.847	0.599	0.828	0.64	drs
Henan	0.692	0.68	0.618	0.787	0.85	0.975	0.695	0.487	0.519	0.37	drs
Hubei	0.587	0.638	0.576	0.734	0.77	0.979	0.85	0.757	0.858	0.614	drs
Hunan	0.52	0.625	0.537	0.694	0.612	0.762	0.757	0.629	0.626	0.709	drs
Guangdong	0.989	0.577	0.639	0.684	0.584	0.871	0.901	0.752	0.752	0.578	drs
Guangxi	0.651	0.562	0.551	0.715	0.793	0.719	0.707	0.754	0.757	1	-
Hainan	1	1	1	1	1	1	1	1	1	1	-
Chongqing	0.399	0.569	0.249	0.347	0.462	0.636	0.565	0.514	0.478	0.537	drs
sichuan	0.417	0.599	0.456	0.421	0.429	0.489	0.824	1	0.81	0.771	drs
Guizhou	0.423	0.469	0.348	0.419	0.956	0.922	1	0.791	1	0.81	drs
Yunnan	1	1	1	1	1	1	0.846	0.904	0.501	0.811	drs
Xizang	1	1	1	1	1	1	1	1	1	1	-
shaanxi	0.51	0.611	0.388	0.679	0.639	0.916	0.68	0.729	0.415	0.633	drs
Gansu	0.416	0.516	0.277	0.503	0.564	0.789	0.923	1	0.664	1	-
Qinghai	0.249	0.271	0.221	0.239	0.205	0.248	0.232	0.167	0.308	0.571	irs
Ningxia	0.492	0.479	0.311	0.478	0.57	0.649	0.525	0.754	0.358	0.378	irs
Xinjiang	1	0.743	0.551	0.657	0.633	0.752	0.981	0.876	1	0.848	irs

Judging from the actual level of comprehensive technical efficiency of fiscal environmental protection expenditures, the efficiency values of fiscal environmental protection expenditures in most provinces in my country between 2013 and 2022 are mostly between 0.5 and 0.7. This shows that there is still a lot of room for improvement in the allocation and application of my country's fiscal funds in energy conservation and environmental protection. It is necessary to further strengthen local fiscal investment in ecology, energy, and the environment and improve the efficiency of fund use.

Among them, Hainan, Tibet, Fujian, Yunnan, Zhejiang, Liaoning, Xinjiang and other places have higher expenditure efficiency; Qinghai, Chongqing, Beijing, Anhui, Tianjin, Hebei, Jilin and other places have lower expenditure efficiency. The reason may be related to the different economic development models and differences in fiscal expenditure structures in various places.

Judging from the changing trend of the efficiency of fiscal environmental protection expenditure, my country as a whole is showing an upward trend. Specifically: the expenditure efficiency of Beijing, Shanghai, Fujian, Jiangxi, Shandong, Guangdong, and Ningxia has declined slightly; the expenditure efficiency of Shanxi, Inner Mongolia, Liaoning, Zhejiang, Sichuan, Guizhou, Gansu and other places has increased significantly; Hebei, Jiangsu, The expenditure efficiency of Hubei, Hainan, Yunnan, Tibet, Xinjiang and other places has basically remained stable. Moreover, the average efficiency of my country's fiscal environmental protection expenditures has increased by nearly 30% from 2013 to 2022. Judging from the returns to scale in 2018, the returns to scale of Liaoning, Guangxi, Hainan, Tibet, and Gansu remained unchanged; Tianjin, Qinghai, Ningxia, Xinjiang has increasing returns to scale; other regions have decreasing returns to scale. This shows that the fiscal environmental protection expenditure in most regions of our country has exceeded the optimal scale, and there is a certain degree of investment redundancy. In addition, areas with increasing or constant returns to scale are mostly economically underdeveloped regions. In essence, it may be related to the limited fiscal revenue and unreasonable expenditure structure of these regions.

3.3.2. Evaluation of Pure Technical Efficiency and Scale Efficiency

From the perspective of pure technical efficiency, Fujian, Guangdong, Hainan, and Tibet have all achieved relatively complete efficiency, while Qinghai, Anhui, Tianjin, Ningxia, Chongqing, Gansu, Beijing and other places are lagging behind. From the perspective of scale efficiency, Hainan and Tibet have achieved relatively complete efficiency, while Beijing, Hebei, Chongqing, Jilin, Jiangsu, Hunan, Sichuan and other places are relatively backward. Comparative analysis of scale efficiency and pure technical efficiency can lead to the following conclusions: First, Fujian and Guangdong are both at the forefront of pure technical efficiency, indicating that they have strong financial resource allocation capabilities and high levels of expenditure management. However, its scale efficiency has not reached the optimal state, and there is still some room for adjustment. Second, Beijing and Chongqing are relatively backward in both pure technical efficiency and scale efficiency. Therefore, the two places urgently need to strengthen comprehensive management in the field of energy conservation and environmental protection. It is recommended to optimize the fiscal expenditure structure, enhance management level, strengthen environmental awareness, and innovate energy conservation. technology, etc. Third, some economically developed regions have lower scale efficiency, which shows that there may be a negative correlation between the efficiency of fiscal environmental protection expenditures and the level of regional economic development.

Table 3. Pure technical efficiency and scale efficiency of provincial government fiscal environmental protection expenditures from 2013 to 2022

	Pure technical efficiency							scale efficiency						
Area/Year	2016	2017	2018	2019	2020	2021	2022	2016	2017	2018	2019	2020	2021	2022
Beijing	0.873	0.873	0.890	0.705	0.838	0.633	0.725	0.661	0.661	0.694	0.672	0.356	0.396	0.367
Tianjin	0.689	0.381	0.802	0.857	0.888	0.373	0.717	0.434	0.999	0.961	0.976	0.917	0.941	0.726
Hebei	0.682	0.685	0.915	0.902	0.418	0.756	1.000	0.453	0.766	0.657	0.644	0.636	0.66	0.637
Shanxi	0.717	0.761	0.976	0.926	0.762	0.756	1.000	0.991	0.979	0.995	0.994	0.966	0.47	0.472
Inner Mongolia	0.745	0.744	0.957	1.000	0.760	0.671	1.000	0.411	0.436	0.763	0.626	0.979	0.907	0.474
Liaoning	0.976	0.959	1.000	1.000	1.000	1.000	1.000	0.932	0.492	0.692	1	1	1	1
Jilin	0.670	0.662	0.722	0.767	0.756	0.733	0.707	0.560	0.555	0.64	0.459	0.765	0.414	0.742
Heilongjiang	0.765	0.712	0.707	0.706	0.764	0.717	0.723	0.415	0.705	0.751	0.663	0.727	0.523	0.665
Shanghai	1.000	1.000	0.799	0.767	0.509	0.572	0.551	0.951	1.000	0.976	0.996	0.467	0.47	0.43
Jiangsu	0.660	0.701	0.656	0.653	0.734	0.444	0.413	0.714	0.639	0.469	0.906	0.767	0.426	0.714
Zhejiang	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.992	1	1	0.431	0.963	0.969
Anhui	0.519	0.687	0.713	0.641	0.565	0.502	0.506	0.923	0.929	0.999	0.935	0.875	0.772	0.667
Fujian	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1	0.897	0.595	0.856	0.917
Jiangxi	0.958	0.953	1.000	1.000	1.000	0.985	0.977	0.730	0.774	0.913	0.836	0.611	0.492	0.488
Shandong	0.852	0.791	0.886	0.994	0.777	0.990	0.978	0.778	0.673	0.899	0.852	0.771	0.837	0.654
Henan	0.885	0.948	1.000	0.784	0.596	0.649	0.638	0.889	0.896	0.975	0.886	0.817	0.799	0.581
Hubei	0.796	0.859	0.980	0.928	0.847	0.956	0.824	0.922	0.897	0.999	0.916	0.893	0.898	0.745
Hunan	0.841	0.831	0.907	0.902	0.902	0.887	0.946	0.825	0.737	0.841	0.839	0.698	0.706	0.75
Guangdong	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.684	0.584	0.871	0.901	0.752	0.752	0.578
Guangxi	0.867	0.895	0.927	0.916	1.000	0.959	1.000	0.825	0.886	0.775	0.772	0.754	0.789	1
Hainan	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1	1	1	1	1
Chongqing	0.631	0.668	0.702	0.714	0.707	0.694	0.756	0.550	0.691	0.907	0.791	0.727	0.689	0.711
sichuan	0.604	0.614	0.615	0.954	1.000	1.000	1.000	0.696	0.698	0.795	0.864	1	0.81	0.771
Guizhou	0.527	1.000	0.852	1.000	0.820	1.000	0.820	0.785	0.856	0.868	1	0.864	1	0.88
Yunnan	1.000	1.000	1.000	1.000	1.000	0.867	1.000	1.000	1.000	1	0.846	0.804	0.518	0.811
Xizang	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1	1	1	1	1
shaanxi	0.722	0.748	0.828	0.813	0.846	0.757	0.722	0.741	0.755	0.777	0.736	0.762	0.547	0.77
Gansu	0.507	0.564	0.822	0.830	1.000	0.674	1.000	0.771	0.777	0.757	0.773	1	0.871	1
Qinghai	0.260	0.205	0.261	0.236	0.175	0.317	0.761	0.717	1.000	0.751	0.774	0.753	0.868	0.751
Ningxia	0.598	0.720	0.854	0.580	1.000	0.371	0.417	0.777	0.772	0.67	0.77	0.754	0.863	0.801
Xinjiang	0.661	0.637	0.773	1.000	1.000	1.000	0.761	0.773	0.773	0.773	0.771	0.776	1	0.886

3.4. Analysis of Influencing Factors of Expenditure Efficiency

3.4.1. Tobit Model Setting

Based on the above assumptions, this paper uses the DEA comprehensive technical efficiency measured previously as the dependent variable to establish the following Tobit model:

$$TE_{it} = \beta_0 + \beta_1 gdp_{i,t} + \beta_2 pop_{i,t} + \beta_3 gov_{i,t} + \beta_4 ind_{i,t} + \beta_5 mar_{i,t} + \beta_6 pub_{i,t} + \beta_7 \xi_{i,t} + u_i + \varepsilon_{i,t} \quad (5)$$

Among them, TE_{it} is the comprehensive technical efficiency of fiscal environmental protection expenditure, β_0 is the constant term of the established equation, $\beta_1 - \beta_7$are the independent variable regression coefficients to be estimated, i represents the provincial administrative region, t represents the period, and u_i does not change with time. The individual effect of , $\varepsilon_{i,t}$ is the random interference term of the regression equation.

3.4.2. Regression Result Analysis

Based on the above model settings, it was first concluded through testing that the model does not have serious multicollinearity. Secondly, the restricted dependent variable Tobit panel model was used for regression, and the results are shown in Table 4.

Table 4. Tobit regression results

Influence factor	coefficient	Standard error	Z-valuet	significant level
Urbanization level	1.0574	0.2091	1.39	0.000***
Marketization level	0.544	0.1598	3.42	0.001***
Population size	0.5562	0.2102	2.45	0.008***
Public participation	0.6444	0.4382	1.65	0.080*
Degree of fiscal decentralization	-8.5888	3.7384	-2.57	0.010***
Economic development level	-0.0318	0.0081	-3.51	0.000***
Industrialization level	-0.0142	0.234	-0.04	0.952
Constant term	-0.7487	0.3958	-1.94	0.052*

Note: *** and * indicate the significance level of 1% and 10% respectively.

There is a significant positive correlation between the level of urbanization and the efficiency of fiscal environmental protection expenditures. This may be caused by the following reasons: First, compared with rural areas, domestic waste in cities is specially treated in special areas instead of being dumped randomly; second, traditional industries that have a huge negative impact on environmental quality are gradually moved out Cities, and the rise of the tertiary industry in cities and its low pollution and low energy consumption will have a positive impact on environmental quality.

The level of marketization is significantly positively correlated with the efficiency of fiscal environmental protection expenditures. Because the higher the level of marketization in a region, the more effective the market mechanism is in regulating economic activities, the higher the degree of freedom in resource allocation, and the better the implementation effect of energy-saving and environmental protection fiscal policies.

There is a significant positive correlation between population size and the efficiency of fiscal environmental protection spending. The expansion of population size can make it more convenient to centrally process domestic waste and put environmental protection facilities into use, thereby effectively reducing the supervision and management costs of local governments providing public services and obtaining certain returns from scale.

There is a significant positive correlation between public participation and the efficiency of fiscal environmental protection expenditures. The higher the education level of residents in an area, the higher their awareness of the hazards of pollutants, and the stronger their willingness to urge the government to adopt long-term mechanisms and measures in exchange for a good environment, thus forcing government departments to improve the efficiency of fiscal environmental protection expenditures. .

The degree of fiscal decentralization is significantly negatively related to the efficiency of fiscal environmental protection spending. At present, there are certain shortcomings in the fiscal expenditure management of local governments in my country, including the imbalance between governance functions and administrative logic and the weakening of the awareness of subject responsibility. Therefore, when our country's local governments have greater freedom of fiscal expenditure, they are more inclined to convert fiscal input into economic growth, that is, the public service function gives way to the economic development function.

There is a significant negative correlation between the level of economic development and the efficiency of fiscal environmental protection expenditures. This may be due to the following reasons: First, areas with a higher level of economic development tend to over-pursue economic benefits and ignore ecological construction; second, areas with a higher level of economic development tend to blindly expand the scale of expenditure to make up for technical efficiency deficiencies.

There is an inverse relationship between the level of industrialization and the efficiency of fiscal environmental protection expenditures, but it is not significant. This shows that the improvement of regional industrialization level or the expansion of the scale of resource-based industries will not necessarily have a negative impact on the efficiency of fiscal environmental protection expenditures. This may be due to the increase in financial subsidies and tax incentives in my country's environmental protection field in recent years, which has encouraged companies to gradually expand investment in energy conservation and environmental protection, which has improved the environmental pollution situation to a certain extent.

3.5. Promotion Path

First, moderately regulate the scale of fiscal expenditures and optimize the structure of fiscal expenditures. The low efficiency of my country's environmental protection fiscal expenditure is caused by scale efficiency. Because some provinces, under the pressure of certain economic assessment indicators, excessively pursue economic growth and neglect environmental protection. There are also some areas that just mechanically implement the central government's environmental policies and apply rigid environmental management models without adapting measures to local

conditions and simply increase the scale of environmental protection fiscal expenditures. Therefore, as my country's environmental protection fiscal expenditures continue to increase, governments should take into account the actual situation of the local environment, rationally reallocate environmental resources, and optimize the scale of environmental protection fiscal expenditures.

Second, governments at all levels should optimize the structure of fiscal expenditures and improve the efficiency of environmental fiscal expenditures. The industrial level is the main factor that pollutes the environment and has a negative hindering effect on environmental efficiency, especially heavy industry. Therefore, all localities should actively promote the optimization of industrial structure and rationally adjust the industrial structure on the basis of giving full play to the advantageous industries of the region, actively promote "mass innovation, innovation by all", continuously improve independent innovation capabilities, and vigorously develop new energy and Energy-saving and environmentally friendly enterprises create a cleaner industrial structure chain. In addition, each region must adapt to local conditions, accelerate the transformation of traditional industries with high energy consumption and high pollution, transform the extensive economic growth model into a growth model that relies on technological innovation and management innovation, actively introduce foreign high-tech investment projects, and gradually eliminate pollution-intensive industries. enterprises, improve industrial production efficiency and technological level, thereby improving environmental efficiency and the quality of economic development.

Third, continue to implement the concept of green development and strengthen the construction of environmental protection systems. It is necessary to implement various systems on environmental protection promulgated by the central government and governments at all levels, promptly summarize the difficulties encountered in the actual actions of environmental governance, and brainstorm solutions to solve them, and publicize and promote the methods adopted in environmental governance. Let more people participate in environmental protection construction, keep the two bottom lines of development and ecology, follow the path of green development with ecological priority, control manganese pollution with an iron fist, and let people enjoy the beautiful environment of blue sky, green water, clear scenery.

Fourth, establish an environmental quality evaluation system to evaluate the performance of environmental governance work. Due to the current "GDP-only" performance evaluation system, government leaders at all levels, while pursuing economic growth to meet assessment and evaluation standards, ignore environmental protection, which is also an important task. In order to truly implement environmental work, rather than just leaving it as a formal or verbal work, a local environmental quality status evaluation system should be established and included in the scope of environmental work assessment.

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