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The Impact of Fiscal and Environmental Protection Budget on Ecological Protection and its Mechanism

-- Based on Provincial Panel Data from 2014 to 2021

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Abstract. This paper uses data from 30 provincial levels in China from 2014 to 2021 to empirically test the impact and mechanism of fiscal and environmental protection budgets on ecological protection. The results show that: (1) government budget expenditure has an enabling effect on ecological protection; (2) The comprehensive environmental situation plays a positive role in the fiscal and environmental protection budget to empower ecological protection; (3) The fiscal and environmental protection budgets of provinces in the eastern and central regions have a significant enabling effect on ecological protection, while the enabling role in the western region is weakened.

Keywords: Fiscal and Environmental Protection Budget; Ecological Protection; Comprehensive Environmental Conditions; Regulatory Effect; Heterogeneity Analysis.

1. Introduction

Since the reform and opening up, China's economy has developed rapidly, and people's living standards have improved significantly, but at the same time, environmental problems have become more and more severe. In the report of the 20th National Congress of the Communist Party of China, General Secretary Xi Jinping emphasized the need to "promote green development and promote the harmonious coexistence of man and nature", and China has always adhered to the strategy of ecological protection and ecological governance, coordinated the industrial structure and ecological protection, and coordinated the promotion of energy conservation and emission reduction, ecological priority and low-carbon development. The government should also implement environmental protection responsibilities in ecological protection, strengthen supervision and management, and translate the ecological goals of "carbon peak" by 2030 and "carbon neutrality" by 2060 into practical actions. In 2019, the 13th National People's Congress amended the Budget Law of the People's Republic of China to further clarify China's budget system and strengthen the awareness and responsibility of China's government budget disclosure. As an important subject of regional development, local governments should clarify the amount and proportion of budget expenditure on energy conservation and environmental protection in the allocation and use of financial funds, give full play to the guiding role of financial funds, and strengthen the public's awareness of ecological protection.

Zhang Qi (2015) [1] pointed out that the government can strengthen the supervision of the masses, improve the performance of the government, and consolidate the foundation of the masses. The government's increase in social and environmental protection budget funds can mobilize the enthusiasm of market players, which is conducive to the formation of environmental protection synergy between local governments and regional enterprises, and then improve the level of ecological and environmental protection. In this paper, the entropy weight method is used to construct ecological protection indicators, the relationship between fiscal environmental protection budget expenditure and ecological protection is explored by benchmark regression, and the internal mechanism is tested through the adjustment mechanism and the regional differences are analyzed by heterogeneity test, so as to provide a theoretical basis for the optimization of the path of government budget to promote ecological protection.

2. Literature Analysis and Research Hypotheses

The budget expenditure on energy conservation and environmental protection can create good external conditions for energy conservation and emission reduction, effectively reduce the input costs and social risks of microeconomic entities, and promote the construction of an environment-friendly society. Barman and Gupta (2010) [2] found that government budget spending has the effect of improving environmental quality through the endogenous growth model. Wang Yafei (2011) [3] found that investment has a positive role in promoting environmental pollution control, and there is strong heterogeneity in financial and environmental protection investment among different provinces. Qiao Baoyun et al. (2014) [4] pointed out in the literature that local governments increasing fiscal and environmental budget expenditures are conducive to reducing pollution emissions. After the completion of the budget law reform in 2014, scholars conducted further theoretical analysis on the relationship between fiscal and environmental protection budgets and ecological protection. Bostan et al. (2016) [5] found that increasing government spending on the environment can significantly improve air quality and improve local ecological levels. Zhu Xiaohui and Lu Yuanquan (2017) [6] also pointed out that fiscal environmental protection expenditure has a role in achieving pollution control. Jiang Nan (2018) [7] believes that fiscal environmental protection expenditure can enhance pollution reduction efforts by strengthening technological innovation, thereby promoting the development of regional ecological and environmental protection. The fiscal budget can coordinate financial resources, and strengthening the fiscal and environmental protection budget can promote regional ecological protection to a certain extent. Therefore, this paper proposes the assumption that:

H1: The fiscal and environmental protection budget has a role in promoting ecological protection.

The comprehensive environmental status can reflect the current situation of regional ecology, and may play an important role in regulating the impact of fiscal and environmental protection budget on ecological protection. Ecological investment funds, capital utilization rate and the number of environmental emergencies can measure the regional environmental status to a certain extent. Deng Rongrong and Zhang Aoxiang (2022) [8] found that economic development can help optimize the industrial structure, reduce the emission of urban environmental pollutants, and reduce the energy consumption of enterprises. The amount of ecological investment is the economic basis for ecological protection, and the level of capital utilization reflects the importance of regional ecological protection and plays an important role in regional environmental pollution control. Zhang Xiangda et al. (2021) [9] found that there is a long-term equilibrium relationship between fiscal environmental protection expenditure and environmental emergency management through Granger causality test, and fiscal environmental protection expenditure is conducive to improving the ability of ecological governance and reducing the number of environmental emergencies. The number of environmental emergencies reflects the regional ecological vulnerability and is a direct indicator to measure the regional ecological status. Therefore, this paper uses the entropy weight method to construct a comprehensive environmental status index, and puts forward the following assumptions:

H2: The overall environmental situation plays a moderating role in the impact of the fiscal environmental protection budget on ecological protection.

Referring to the literature of Jiang Tuanbiao et al. (2022) [10], it can be seen that the expenditure of local government funds will directly affect the effect of ecological protection, and the regional factors of the government may also affect the role of environmental protection budget on ecological protection. Hu Lina et al. (2023) [11] pointed out that the squeezing effect of rigid fiscal expenditure on fiscal and environmental protection budgets in different provinces is different, and the government's energy conservation and environmental protection funds are limited, and it is difficult to drive green technology innovation in the region, resulting in low ecological protection efficiency, thus forming regional differences. Therefore, the following hypotheses are proposed:

H3: There are regional differences in the role of fiscal environmental protection budget on ecological protection.

3. Research Design

3.1. Data Description

In view of the fact that China's provincial budgets were released after the revision of the Budget Law in 2014, this paper takes 30 provinces as a sample and sets the time period from 2014 to 2021, and the specific data are from the China Statistical Yearbook. In this paper, the sample data are processed as follows: (1) due to the continuous absence of the Tibetan sample data, in order to reduce the bias of the regression results, this paper does not consider them, (2) the data is combined with time and province as fixed variables to obtain the panel data with 240 observations, and (3) the selected variables are Winsorize to exclude the influence of extreme values.

3.2. Variable Selection

3.2.1. Explanatory Variable – Ecological Conservation (EP)

In order to eliminate the dimensional differences between the variables, the entropy weight method was used to construct the indicators of ecological protection.

Table 1. Construction of ecological protection indicators

Level 1 Indicator	Level 2 Indicator	Attribute	Weight
Ecological protection	Investment in industrial pollution control	+	39.71%
	Waste harmless disposal rate	+	24.90%
	Investment in environmental pollution control	+	35.39%

3.2.2. Explanatory Variable – Fiscal and Environmental Budget (PBE)

The fiscal environmental protection budget expenditure is conducive to creating an ecological and environmental protection atmosphere, enhancing the awareness of social ecological protection, and at the same time providing financial support for ecological protection, so as to improve the local ecological protection capacity. Therefore, this paper takes the annual budget expenditure of energy conservation and environmental protection of the government as a proxy variable, and takes the logarithmic treatment of it in order to eliminate the influence of heteroskedasticity.

3.2.3. Moderating Variable – Comprehensive Environmental Situation (ENV)

Table 2. Construction of comprehensive environmental status indicators

Level 1 Indicator	Level 2 Indicator	Attribute	Weight
synthesis environment state	Ecological investment funds	+	31.21%
	Utilization of funds	+	24.82%
	The number of environmental emergencies	-	43.97%

In this paper, three variables of regional ecological investment, capital utilization rate and number of environmental emergencies are selected, and the entropy weight method is used to construct a comprehensive ecological index. Among them, the ecological investment reflects the intensity of regional ecological investment, and the utilization rate of funds reflects the degree of ecological attention, so it is a positive indicator of regional ecological status, and the number of environmental

emergencies reflects the regional ecological risk resistance, so it is used as a negative indicator to describe the regional ecological status.

3.2.4. Control Variables

Referring to the relevant literature, it can be seen that the greening rate of built-up areas affects the role of fiscal energy conservation and environmental protection budget to a certain extent, the urbanization rate can have an impact on the type of government budget expenditure, and the level of economic development may improve or decrease the efficiency of ecological governance.

3.3. Model Setting

In this paper, the following regression model is established for testing:

$$EP_{p,t} = \alpha_0 + \alpha_1 PBE_{p,t} + \rho Controls + \sum Pro + \sum Year + \in_{p,t}$$

Among them, EP represents ecological protection, PBE represents fiscal and environmental protection budget expenditure, and Controls is the control variable, which is the fixed effect of the province and the fixed effect of time, and the province represents the time.

In this paper, the comprehensive ecological indicators were selected as the moderating variables, and the following models were established to explore the moderating effects:

$$EP_{p,t} = \varphi_0 + \varphi_1 PBE_{p,t} + \varphi_2 ENV_{p,t} + \varphi_3 PBE_{p,t} \times ENV_{p,t} + \omega Controls + \sum Pro + \sum Year + \mu_{p,t}$$

4. Empirical Analysis

4.1. Benchmark Regression

Table 3. Baseline regression

Variable	(1)	(2)	(3)	(4)
	EP	EP	EP	EP
PBE	0.2150**	0.2140**	0.2097*	0.2245**
	(2.00)	(1.99)	(1.96)	(2.07)
UGS		0.1391	0.1254	0.0417
		(0.34)	(0.31)	(0.10)
UCL			-0.4326	-0.4914*
			(-1.61)	(-1.78)
ESR				0.7900
				(0.87)
_cons	9.8596***	8.3088*	11.6457**	9.8538*
	(18.33)	(1.80)	(2.31)	(1.81)
Time effect	Control	Control	Control	Control
Province effect	Control	Control	Control	Control
N	240	240	240	240
R^2	0.8014	0.8015	0.8041	0.8048
Adj-R^2	0.7650	0.7640	0.7659	0.7656

In order to ensure the quality of the selection of variables in the model, the multicollinearity test is carried out in this paper, and the variance expansion factor (VIF) is less than 10, indicating that the

variable selection is reasonable. Based on the appeal model, this paper conducts regression analysis on the control province effect and the time effect, and after gradually adding the control variables of prefecture-level related characteristics, the impact of fiscal environmental protection budget on ecological protection is always positive and the significance of the two is enhanced.

4.2. Robustness Test

Considering the continuous impact of urban greening and construction land on ecological protection, this paper carried out a lag period treatment on the urban greening coverage area and urban construction land area, and re-performed the benchmark regression to obtain the results of column (2) and column (3) in Table 4, respectively. The results show that although the significance of urban green coverage area and urban construction land area is slightly reduced after a lag of one period, the positive promotion effect of fiscal environmental protection budget on ecological protection can still pass the 10% significance test. Therefore, the benchmark regression results have some robustness.

Table 4. Robustness test

Variable	(1) EP	(2) EP	(3) EP
PBE	0.2245** (2.07)	0.2020* (1.75)	0.2043* (1.77)
ESR	0.7900 (0.87)	1.0496 (0.96)	0.9799 (0.91)
UGS	0.0417 (0.10)	0.1823 (0.30)	0.0395 (0.08)
UCL	-0.4914* (-1.78)	-0.7547 (-1.50)	-0.4350 (-1.24)
UGS^1		-0.1961 (-0.31)	
UCL^1			0.4025 (0.89)
_cons	9.8538* (1.81)	9.0497 (1.30)	8.1328 (1.28)
Time effect	Control	Control	Control
Province effect	Control	Control	Control
N	240	210	210
R^2	0.8048	0.8046	0.8054
Adg-R^2	0.7656	0.7583	0.7593

5. Mechanism Testing and Heterogeneity Analysis

5.1. Inspection of the Adjustment Mechanism

Column (2) in Table 6 shows that the interaction term between PBE and EP is significantly positive at the 1% confidence interval, that is, the comprehensive ecological indicators play a significant positive moderating role. The better the regional ecological situation, the greater the role of the fiscal environmental protection budget in promoting ecological protection, which proves the correctness of H2.

5.2. Heterogeneity Analysis

EP1, EP2 and EP3 in Table 6 represent the eastern, central, and western baseline regression results, respectively. The positive relationship between fiscal environmental budget and ecological protection in the eastern region can pass the 10% significance test, while the positive relationship between fiscal environmental protection budget and ecological protection in the central region is significant in the

5% confidence interval, while the linear relationship between fiscal environmental protection budget and ecological protection in western provinces is not significant. Therefore, there is heterogeneity among provinces, which verifies the correctness of H3.

Table 5. Moderating effect test

Variable	(1)	(2)
	EP	EP
PBE	0.2167**	0.7289***
	(1.98)	(3.78)
ENV	0.1137	-0.0031
	(0.72)	(-0.02)
ESR	0.7779	1.0255
	(0.86)	(1.16)
UCL	-0.5531*	-0.5510*
	(-1.91)	(-1.94)
UGS	0.0219	-0.0056
	(0.05)	(-0.01)
PBE×ENV		0.0007***
		(3.19)
_cons	9.8547*	7.3740
	(1.81)	(1.37)
Time effect	Control	Control
Province effect	Control	Control
N	240	240
R^2	0.8053	0.8149
Adj-R^2	0.7650	0.7754

Table 6. Heterogeneity analysis

Variable	(1)	(2)	(3)	(4)
	EP	EP^1	EP^2	EP^3
PBE	0.2245**	0.6592*	0.8729**	0.0602
	(2.07)	(1.92)	(2.10)	(0.55)
ESR	0.7900	1.5967	2.5832	-1.0560
	(0.87)	(0.67)	(1.43)	(-0.74)
UCL	-0.4914	-0.8633**	-1.1627	-0.1356
	(-1.78)	(-2.13)	(-1.39)	(-0.13)
UGS	0.0417	-2.0206	-0.3341	0.5031
	(0.10)	(-1.44)	(-0.44)	(0.82)
_cons	9.8538*	31.4020*	9.1394	9.9619
	(1.81)	(1.70)	(1.00)	(1.11)
Time effect	Control	Control	Control	Control
Province effect	Control	Control	Control	Control
N	240	88	64	88
R^2	0.8048	0.8605	0.7113	0.7761
Adj-R^2	0.7650	0.8162	0.5958	0.7049

6. Summary and Suggestions

The fiscal and environmental protection budget is of great significance to regional ecological protection. Taking the provinces from 2014 to 2021 as a sample, this paper empirically analyzes the impact of fiscal and environmental protection budgets on ecological protection and examines its mechanism. The benchmark regression results show that the fiscal environmental protection budget has a positive effect on ecological protection, and the promotion effect is still significant after the control variables are gradually added to the benchmark regression model. In the mechanism test analysis, the moderation mechanism test and heterogeneity analysis test are used. The results of the adjustment mechanism test show that the comprehensive environmental situation can be used as a regulatory factor to affect the positive effect of the fiscal environmental protection budget on ecological protection, and the better the regional comprehensive environmental situation, the stronger the enabling effect of the fiscal environmental protection budget. The results of heterogeneity analysis showed that the role of fiscal environmental protection budget in empowering ecological protection was more significant in the eastern and central regions, while it could not pass the significance test in the western region.

In this paper, we explore the mechanism of fiscal and environmental protection budget on ecological protection, and derive the following optimization paths. First, coordinate the financial relations between the central and local governments and enhance the financial resources of local governments. The central government can expand the scale of local governments' environmental protection budgets through transfer payments and environmental protection subsidies, alleviate the financial pressure on government environmental protection expenditures, and increase support for ecological protection. Second, appropriately increase the proportion of funds in the local financial and environmental protection budget, and increase the intensity of the local public budget to promote ecological protection. Ecological protection needs financial support, and the government should coordinate financial resources under the established budget expenditure, give full play to the guiding role of financial funds, improve the awareness of regional ecological protection, appropriately increase the proportion of fiscal and environmental protection budgets, and consolidate the economic foundation of ecological and environmental protection, so as to improve the level of ecological protection and governance. Third, improve the capacity of regional environmental protection governance. While increasing the expenditure of fiscal budget funds, the government should formulate a standardized ecological protection system, restrain the behavior of the public, and do a good job in the top-level design of managers, so as to improve the governance effect of regional ecological protection.

References

[1] Mo Longjiong, Zhang Xiaolu. Rule of Law of Government Budget, Fiscal Transparency and Local Fiscal Efficiency--Based on the Evidence of the Implementation of the New Budget Law[J]. Contemporary Finance and Economics, 2023 (05): 39-51.

[2] BARMAN T R, GUPTA M R. Public expenditure, environment, and economic growth[J]. Journal of Public Economic Theory,2010,12 (6):1109-1134.

[3] Wang Yafei. Analysis of the impact of public financial environmental protection investment on environmental pollution[J]. Journal of Fiscal Research,2011(2):38-42.

[4] Qiao Baoyun, Liu Lezheng, Yin Xundong, et al., "Comparative Analysis of Local Government Incentive System", Economic Research Journal, No. 10, 2014.

[5] BOSTAN I,ONOFREI M,DASC LU E-D, et al. Impact of sustainable environmental expenditures policy on air pollution reduction, during European integration framework[J]. Amfiteatru Economic Journal,2016,18 (42): 286-302.

[6] Zhu Xiaohui, Lu Yuanquan. Open Economy, Environmental Protection Fiscal Expenditure and Pollution Control: Empirical Evidence from China's Provincial and Industry Panel Data[J]. Chinese Population, Resources and Environment, 2017, 27(10):10-18.

[7] Jiang Nan, Does Environmental Fiscal Spending Help Achieve a Win-Win Situation for the Economy and the Environment? Journal of Zhongnan University of Economics and Law,2018(1):95-103.

[8] Deng Rongrong, Zhang Aoxiang. Research on the impact and mechanism of China's urban digital economy development on environmental pollution[J]. Southern Economy,2022,No.389(02):18-37.

[9] Zhang Xiangda, Yang Ming, Liang Chao. Financial environmental protection expenditure and environmental emergency governance: cointegration analysis based on provincial panel data from 2007~2019[J]. Industrial Organization Review, 2021,15(03):209-223.)

[10] Jiang Tuanbiao, Luo Lin. Financial support for agriculture and food security--An empirical analysis based on regional differences[J]. World Agriculture,2022(02):66-79.

[11] Hu Lina, Xue Yang. Fiscal environmental protection expenditure, fiscal pressure and green development[J]. Soft Science, 2023,37(09):39-46.