



Green Fiscal and Tax Effects are Analyzed From the Perspective of Green Input-output

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Abstract. Based on the relevant data of 31 provinces and cities from 2016 to 2020, this paper adopts the green GDP accounting model, establishes a model from the perspective of green input-output, discusses the relationship between green fiscal and tax input and green GDP output, analyzes the impact mechanism of green tax policy on green economy and its regional and development heterogeneity. It is found that green GDP shows a certain dependence on green fiscal and tax input, and the eastern region or economically developed region is more dependent on green tax, and the western region or economically underdeveloped region is more dependent on green finance. Therefore, under the condition of constrained financial funds, different fiscal and tax means should be adopted in different regions to develop green economy, and the regions with strong dependence on green taxation should focus on optimizing green tax system and coordinating green tax policies. Regions with strong dependence on green finance should focus on green fiscal subsidies and optimize the structure of green fiscal expenditure. Give full play to the supporting role of green fiscal and tax policies in green development and the green and low-carbon transformation of society.

Keywords: Green tax; Green finance; Green economy; Green development

1 INTRODUCTION

Since the developed countries appeared serious environmental pollution problems in the 1960s, people began to pay attention to environmental protection. By the 1980s, the first report on the use of economic means to protect the environment was published, and countries around the world gradually used national financial and tax economic means to improve the environment. As the environmental pollution problem becomes more and more serious, the research on green concepts such as green taxation and green finance has also received further attention, and it is urgent to guide the society to the green transformation of low-carbon system(Reis M M et al,2023)^[1]. Fiscal and taxation policies are one of the important economic means for the government to promote the improvement of ecological environment and promote the green and low-carbon transformation of society. At present, China has established a green fiscal and taxation system with multiple links and multiple taxes in parallel, but the theoretical research on green fiscal and taxation in China started late, and there are still some problems in the

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construction of green fiscal and taxation system (Dong et al.,2020)^[2].These problems will not only restrict the process of national ecological maintenance and economic development, but also cause a certain financial burden on the government, making it difficult to achieve the expected goals.

2 LITERATURE REVIEW

Studies on green finance and taxation in the existing literature are mainly divided into the following categories according to their different aspects of emphasis:

First, we will use green fiscal and tax policies to promote the green transformation of enterprises. Enterprises with high pollution and high energy consumption have a large demand for pollution discharge, destroying the balance of the ecological environment. In order to realize the sustainable development of economy and society, we should first balance the pollution cost and environmental benefit of enterprises through tax and fiscal policies, so that enterprises can invest funds in energy-saving and emission reduction equipment or industries, reduce the amount of pollution discharged by enterprises, improve the operation mode of enterprises and transform the industrial structure(Rabia I et al,2022)^[3].

Second, accelerate the transformation of energy consumption through green fiscal and tax policies. China's resource-based areas are rich in energy and mineral reserves, and the traditional economic model is mainly based on energy consumption to promote growth(Sharif Arshian et al,2023)^[4].Continuous exploitation of mineral resources will not only destroy the geological structure, but also emit harmful gases to the atmosphere and lead to environmental deterioration. Therefore, a new type of fiscal and tax policy should be established to maintain environmental benefits. We should attach importance to the role of fiscal and tax policies in regulating the energy structure and promoting green and low-carbon energy technology innovation.

Third, we should pay attention to the role of green fiscal and tax policies in green technological innovation. Science and technology have the characteristics of publicity and spillover, and green technology is a new technology that can reduce the emission of environmental pollutants and save energy consumption. The use of green technology innovation can promote the improvement of environmental protection benefits(Liang and Gao,2009)^[5]. Green technology innovation is the driving force for the development of circular economy, and connects the economic benefits of enterprises and the ecological benefits of society through green technology innovation, so as to coordinate them, give full play to the sustainable development of enterprises, and constantly improve the green competitive advantage(Xu and Zhang,2011)^[6].

3 RESEARCH DESIGN

3.1 Theoretical analysis and research hypothesis

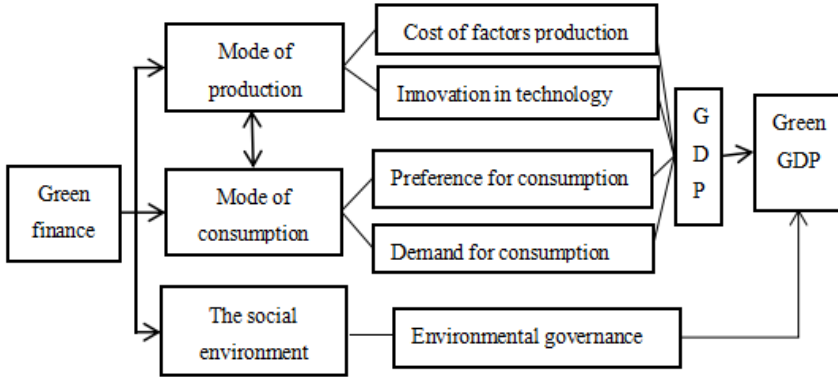


Fig. 1. Green fiscal and tax impact mechanism

Green GDP is the core index to measure social environmental economy. It considers natural environmental factors on the basis of traditional GDP, reflecting both the level of economic growth and the harmony of natural environment. Green finance and taxation means that the government uses economic means or administrative means to adjust the environmental market mechanism to indirectly affect the development of green economy. Production and consumption are the basis to promote economic development, and green GDP is also affected by environmental governance. According to the above influencing factors, the mechanism of green finance and taxation affecting green economy is divided into three aspects, namely, production, consumption and environment. As shown in Figure 1. meanwhile, the following hypothesis is proposed

H1: Green taxation has a positive impact on green GDP.

H2: Green finance has a positive impact on green GDP.

H3: There are differences in the performance of green fiscal taxation and green economic development in different regions.

3.2 Model building

The main purpose of this paper is to study the effect and mechanism of green fiscal and tax policies on green GDP, and analyze the problems existing in green fiscal and tax policies from the perspective of the effect of green fiscal and tax input and green GDP output. Therefore, this paper uses regression model for empirical analysis. As shown in Equation(1):

$$Lgdp_{it} = \alpha_0 + \alpha_1gtax_{it} + \alpha_2zc + \beta Control_{it} + \delta_i + \tau_t + \varepsilon_{it} \tag{1}$$

Where $Lgdp_{it}$ represents the indicator of national green GDP of province i in period t ; $gtax_{it}$ represents the green tax input component of province i in period t ; zc represents the national green fiscal expenditure of province i in period t ; $Control_{it}$ represents the control variable in the regression; δ_i represents the regional disturbance term; τ_i represents the time disturbance term; ϵ_{it} represents the random disturbance term.

3.3 Variable selection and data source

3.3.1 The explanatory variables.

The explanatory variables in this paper are the indicators of green tax input and green fiscal input. The calculation formula is shown in Equation(2):

$$gtax_{it} = rest_{it} + uct_{it} + vvt_{it} + lut_{it} + fct_{it} + ept_{it} \quad (2)$$

Where $rest_{it}$, ept_{it} , uct_{it} , vvt_{it} , lut_{it} , fct_{it} , ept_{it} respectively represent the resource tax, environmental protection tax, urban construction tax, vehicle and ship tax, land use tax, cultivated land occupation tax and environmental protection expenditure of i Province in t period.

3.3.2 The explained variable.

The explained variable takes the green GDP value as the core explained variable, adopts the green input-output table, and takes green GDP as the indicator to measure the green output effect. The calculation formula of green GDP is shown in equation(3):

$$Lgdp_{it} = GDP_{it} - (ecc_{it} + pec_{it} + pinv_{it}) \quad (3)$$

Where GDP_{it} , ecc_{it} , pec_{it} and $pinv_{it}$ respectively represent the gross product, energy consumption cost, pollution emission cost and total pollution control investment of i province in t period.

3.3.3 Control variables.

Control variables include government environmental awareness (YS_{it}) expressed as the proportion of government environmental protection expenditure to government fiscal expenditure; Natural disaster losses (nat_{it}) are expressed in terms of natural disaster losses by region and period; Garbage removal situation (gar_{it}) is expressed by the amount of urban solid waste removal in each region and period. Data sources were collected and calculated from China Statistical Yearbook or provincial statistical Yearbook for 2016-2020, and the data of environmental protection tax in 2016 and 2017 were collected and calculated from China Environmental Yearbook.

4 EMPIRICAL ANALYSIS

4.1 Baseline regression analysis

In order to test hypothesis1 and hypothesis2, with gross green product and gross domestic product as explained variables, and green tax revenue and green fiscal expenditure as explained variables, OLS fixed effect model was adopted for regression analysis of the total sample. The baseline regression results are shown in Table 1:

Table 1. Results of baseline regression

variable	Lgdp	GDP
gtax	0.068*** (3.05)	0.062*** (2.92)
zc	0.099*** (2.77)	0.085** (2.50)
Constant term	0.032*** (19.51)	0.032*** (19.76)
Control variable	Control	Control
R ²	0.999	0.999

Table 1 reports the empirical results of green tax input and green output. As can be seen from the regression results, when green tax input increases by one percentage point in the total sample, GDP increases by 0.062 percentage points, while green GDP increases by 0.068 percentage points, and this increase is significantly positive. It shows that the level of green tax input significantly affects the development of GDP and also has a certain impact on green GDP thus verifying hypothesis H1. In the total sample, green fiscal expenditure increases by one percentage point, and green GDP increases by 0.099 percentage points. Moreover, the influence coefficient of green fiscal expenditure on green economic output is significantly positive, indicating that green fiscal expenditure and green GDP are significantly positively correlated. Thus, hypothesis H2 is verified.

4.2 Heterogeneity analysis

The model is divided according to different geographical environments and different levels of economic development, and the heterogeneity analysis of sub-samples is carried out, and hypothesis 3 can be further verified through the heterogeneity analysis.

Table 2. Analysis of geographical environment heterogeneity

	Eastern region		Central region		Western region	
	Lgdp	GDP	Lgdp	GDP	Lgdp	GDP
gtax	0.113** (2.45)	0.106** (2.36)	0.045 (1.12)	0.044 (1.11)	0.037 (1.53)	0.024 (1.15)
zc	-0.074 (-0.68)	-0.068 (-0.65)	0.084 (1.09)	0.058 (0.76)	0.092*** (2.77)	0.068** (2.36)
Constant	0.034*** (13.96)	0.033*** (13.98)	0.006* (1.74)	0.008** (2.54)	0.008*** (4.18)	0.012*** (6.91)
R ²	0.999	0.999	0.998	0.998	0.999	0.999

As shown in Table 2, heterogeneous sample estimation based on different geographical locations shows that in terms of green tax input, although the influence coefficients of all regions are positive, the central and western regions do not show significant influence. It shows that green tax input has a positive role in promoting green economic output, but it does not play a significant role in the central and western regions. In terms of green fiscal expenditure, the influence coefficient of the eastern region is negative, the influence coefficient of the central region is positive but shows no significant effect, and the western region shows a significant positive impact of green fiscal expenditure on green GDP, indicating that the geographical differences of regions show the difference of the impact of green fiscal and tax on green GDP.

Table 3. Analysis of economic development heterogeneity

	Developed economy		Medium economy		Economic backwardness	
	Lgdp	GDP	Lgdp	GDP	Lgdp	GDP
gtax	0.252*** (4.61)	0.247*** (4.63)	-0.001 (-0.04)	-0.019 (-0.54)	0.026 (1.64)	0.027* (1.84)
zc	0.019 (0.19)	0.007 (0.07)	0.095 (1.56)	0.102* (1.85)	0.118*** (4.15)	0.099*** (3.73)
Constant	0.032*** (13.32)	0.031*** (13.32)	0.033*** (12.09)	0.032*** (13.25)	0.011*** (10.95)	0.011*** (12.06)
R ²	0.999	0.999	0.992	0.993	0.995	0.996

As shown in Table 3, the effect of green taxation on green GDP is significant in economically developed regions, negatively correlated in economically medium regions, and not significantly positively correlated in economically underdeveloped regions. Contrary to the performance of green taxation, green fiscal expenditure does not significantly depend on green economic development in economically developed areas and economic medium areas, while green fiscal expenditure has a greater effect on green GDP in economically underdeveloped areas. It shows that different levels of economic development also show different degrees of dependence of green GDP on green finance and taxation.

4.3 Robustness test

In order to ensure the reliability of the research conclusions and solve the possible endogeneity problem between green GDP, green tax input and green fiscal expenditure, the robustness of the model was tested by using the method of changing research intervals. shown in Table 4. The results show that after adjusting the research interval, green tax input and green fiscal expenditure still have a significant positive effect on the development of green economy, indicating that the research results are stable.

Table 4. Robustness test of the transformation study interval

	lgdp
gtax	0.067*** (3.00)
zc	0.102*** (2.75)
R ²	0.999

5 CONCIUSIONS

Based on the green input-output method, this paper conducts an empirical analysis, discusses the impact mechanism of green fiscal and tax policies on green GDP, analyzes the implementation effect of green fiscal and tax, and analyzes its heterogeneity according to the division of regions and economic development level. The conclusion is that green fiscal and tax has a significant promoting effect on green GDP. The effect of green finance and taxation on green GDP is different. In order to establish and improve a fiscal and taxation policy system conducive to green and low-carbon development, and better play the role of fiscal and taxation in promoting green and low-carbon development, the government should improve the green fiscal and taxation system to coordinate green fiscal and taxation policies, optimize the structure of green fiscal expenditure, accurately invest green funds, improve the government's green management ability and strengthen the integration of rigid and flexible mechanisms to reduce the cost of green development. We will explore and establish a high-quality development path that prioritizes ecology and focuses on green development.

REFERENCES

1. Reis M M, Rosangela B, Fraga R S. Evolution of Green Finance: A Bibliometric Analysis through Complex Networks and Machine Learning[J]. *Sustainability*,2023,15(2).
2. Dong Zhanfeng, Long Feng, BI Fanfan, YUAN Zilin. Ideas and key points of the national 14th Five-Year Plan green fiscal and tax policy reform [J]. *Environmental Protection*,2020,48(18):42-45.
3. Rabia I, Sumayya C, Amna S, et al. Does green finance matter for environmental safety? empirical evidence from the atomic power states[J]. *Cogent Business & Management*,2022,9(1).
4. Arshian S, Tevfik M K, Victor F B, et al. Role of green technology, environmental taxes, and green energy towards sustainable environment: Insights from sovereign Nordic countries by CS-ARDL approach[J]. *Gondwana Research*,2023,117.
5. Liang Yunfeng, Gao Huiqing. Suggestions on fiscal and tax policies to encourage green technology innovation [J]. *Tax Research*,2009(11):17-20.
6. Xu Jingting, Zhang Bing. Research on fiscal and tax policies to promote enterprises' green technology innovation -- based on the perspective of circular economy. [J] *Science and Technology Management Research*,2011,31(09):6-9.

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