

Green Finance Boosts Economic High-quality Development in Guizhou Province

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Abstract. China's economic high-quality development (EHQD) faces severe tests, and green finance (GF) is a key element and focus of high-quality development. This research analyzes the mechanism of GF to promote EHQD by using the data of Guizhou from 2008 to 2020. We establish a multiple regression model to empirically analyze the impact of GF promotes EHQD. The results show that GF development can boost EHQD. Research results of this article provide a theoretical basis for pushing forward EHQD in China, and also draw policy inspiration for improving the green financial system.

Keywords: Green finance; economic high-quality development; promoting effect.

1. Introduction

In spite of the rapid growth of the world economy, environmental pollution and other problems have become increasingly serious. Sustainable development has become an inevitable key issue for countries worldwide. China, the world's largest energy consumer as well as carbon emitter, should not ignore the negative impacts brought by the excessive growth of its economy. How to achieve the economic high-quality development (EHQD) is a pressing task.

In order to achieve sound and rapid economic growth, the Chinese government vigorously develops green finance (GF). In August 2016, seven government agencies jointly released the Guidelines for Establishing the Green Finance System, in which the definition of GF is clarified, and eight major measures were proposed, including vigorously promoting green credit development, boosting securities market in financing green investment, and launching a green development fund. As of 2021, China's green credit market ranks first in the world, and the green bond market second, which displays that China has become a significant champion and leader in the development of global GF.

To verify the effect of GF on EHQD, this article selects the comprehensive index data of GF and EHQD in Guizhou from 2008 to 2020, adopts the entropy method to measure the level of GF and EHQD, and uses the multi regression model to test the impact of GF on EHQD. Research results show that GF in Guizhou can promote EHQD. Meanwhile, government intervention, industrial development and technological progress also play a positive role in advancing EHQD.

2. Literature References

2.1 Green Finance

GF began in the 1970s and has been developing as a combination of financial and business activities with environmental protection concepts^[1]. There is a wealth of academic research on it. Domestic and foreign scholars' research on it mainly focuses on three aspects: the theoretical

discussion of GF, its connotation and evaluation index, and the role of green finance in alleviating environmental pollution. Cowan^[2] pointed out that GF is the intersection of finance and green economy, highlighting the harmonious development between environment and economy, and guiding the capital flow of the financial sector to the field of environmental protection. Zhang^[3] (2019) et al., through literature review, concluded that GF should be regarded as an interdisciplinary research topic that includes and relates to policy, investment and governance in climate adaptation finance and investment. Gao and Zhang^[4] established a provincial GF development level assessment system in China from the five dimensions of green credit, securities, insurance, investment and carbon finance to analyze the impact of GF on the ecologicalization of industrial structure. Tariq and Hassan^[5] established the green finance index from the four dimensions of green securities, investment, bonds and carbon finance to evaluate the green finance development level of 70 countries around the world to measure the impact of green finance on environmental sustainability by reducing carbon dioxide emissions. Chen and Guan^[6] held that GF can effectively improve air pollution, and the improvement has obvious spatial spillover effects. Umar and Safi^[7] used the motion quantile regression method to analyze and prove that GF can significantly reduce carbon emissions in OECD countries.

2.2 High-quality development

Wang and Chen^[8] built an evaluation index system for regional EHQD in China based on the new development philosophy of innovative, coordinated, green, open and shared growth, and analyzed the spatial location distribution characteristics of EHQD in China's 30 provinces. Chen Xi and Xing^[9] explored the coordinated development effect of digital finance and EHQD based on provincial panel data and found that digital finance and EHQD interact and coordinate with each other and can achieve coordinated growth. Yang^[10] found that ageing populations will hinder EHQD and have spatial spillover effects, but consumption upgrading can mitigate the negative impact. Li and Liu's research^[11] discovered that EHQD has obvious spatial heterogeneity, and environmental regulation has an obvious positive spatial spillover effect on EHQD. Mao^[12] et al. established a EHQD index evaluation system in the western region based on the new development philosophy and the relevant requirements set in the development of Western China, and found that EHQD in the West has been steadily advanced year by year, but there is still a notable gap between the 11 provinces. Research results showed the overall characteristics of high in the middle and low in the edge. Zhang^[13] et al. established an evaluation index system for ecological environment and EHQD, and used a comprehensive evaluation method and a coupling coordination degree model to verify the level of development, coupling coordination relations, interaction and coordination relationship, and spatial and temporal evolution characteristics of the two.

2.3 Green finance promotes high-quality economic development

GF can proactively drive the flow of funds into green and ecological sector and boost consumption in the green industry, thus promoting EHQD. Sustainable development of the community economy can be achieved by flexibly and efficiently using Internet financial tools and increasing investment in environmental protection products. Wang^[14] et al. indicated that China's GF will optimize the macroeconomy by improving investment and economic structure, stabilizing economic growth, and promoting green consumption. Chen^[15] et al. noted that the development of GF can fundamentally and effectively inhibit the expansion of the "two high and one surplus" industries, namely, industries of overcapacity, and guide funds to flow again to green and environmental protection related fields. Wang and Wang^[16] found that accelerating to guide improvement and upgrading of industrial structure within the public and enterprises and at the national level, and promoting the coordinated development of regional economy and ecological environment is the path for GF to facilitate EHQD. Research by Liu^[17] et al. found that pilot policies for green financial reform and innovation can boost EHQD through the upgrading and rationalization of industrial structures, and also urge highly polluting enterprises to fulfill their

pollution control responsibilities. Liu and Meng^[18] found that there exists obvious heterogeneity in the promotion of EHQD through GF in different regions. Also, the promoting effect of GF on EHQD is more evident in the eastern region, and GF in regions with a high degree of informatization plays a greater role in pushing forward EHQD.

3. Model and data

3.1 Model

Through capital-oriented mechanism, risk aversion mechanism and leverage, GF rationally allocates funds to the real economy and promotes coordinated and efficient economic development. At the same time, GF can promote the upgrading of industrial structure and progress of green technology and technological innovation (TI) by guiding the flow of funds to green development and environmental protection. Industrial structure upgrading and TI can advance green, innovative, shared and open development, and then achieve EHQD. Therefore, in order to conduct an in-depth analysis on the linear impact of GF on EHQD, this article draws on the researches of Pan and Luo[19], Gao et al.[20], Han and Ma[21], Yang and Zhang[22], and constructed the following multiple regression model:

$$HQ_t = \beta_0 + \beta_1 GF_t + \sum \beta_i X_t + \varepsilon_t \quad (1)$$

In this model, HQ is the explained variable, which represents the comprehensive index of EHQD; GF is the core explanatory variable, which represents the green financial development index. Xi is the control variable, representing other influencing factors, including government intervention (GOV), the level of industrialization (IND) and technological progress (IT). β represents the regression coefficient; ε represents the random disturbance term of the model. The above variables are logarithmized, so as to avoid heteroscedasticity and eliminate time trends.

3.2 Variables

Explained variable (EHQD). Some scholars have measured EHQD. Based on the scholars' research, this article selects momentum, structure and quality of economic development as the first-level indicators to measure EHQD. In the first-level indices, 8 second-level indicators containing scientific and technological development and human capital, and 19 third-level indicators are selected to comprehensively describe EHQD. The specific index system is shown in S1.

Explanatory variables (GF). The GF indicator system is established from green credit, green securities, green investment and green insurance. First, green credit is measured by the proportion of interest expenditure of high-energy-consuming enterprises. The high-energy-consuming industries are petroleum processing, coking and nuclear fuel processing, raw chemical materials and chemical products, nonmetal mineral products, ferrous metal smelting and rolling processing industry, non-ferrous metal smelting and rolling processing industry, electricity and heating production and supply industry. Second, green bonds are measured by the proportion of market value of high-energy-consuming industries. Third, green investment is measured by the proportion of energy conservation and environmental protection expenditure. Fourth, due to time range of this study, green insurance is measured by the proportion of rural insurance scale and rural insurance loss ratio in that the environmental pollution liability insurance was implemented in China in 2013. this article will use the entropy method to synthesize the GF indicator. Specifically, the selection and definition of index are shown in S2.

(3) Control variables. EHQD is not only affected by the development of GF, but also by other macroeconomic variables. Therefore, the following macroeconomic variables are selected as other influencing factors: government intervention (GOV), the level of industrialization (IND) and technological progress (TI). The proportion of fiscal expenditure to GDP indicates government intervention; the number of industrial enterprises above designated size is used to indicate the level

of industrialization; the ratio of industrial R&D project expenditure to industrial added value is logarithmic to measure technological progress.

3.3 Data

The comprehensive indicator data of GF and EHQD in Guizhou from 2008 to 2020 is selected, and the entropy method is used to measure the level of GF and EHQD. Before calculating the entropy value, in order to avoid subjectivity from affecting the research results and solve problems such as type and dimension inconsistencies between evaluation indicators, we first use the normalization method to exclude dimension for the original indicators. Then, the entropy method in the objective weighting methods is used to calculate the weight of indicators. This method uses the degree of differences between each evaluation indicator to describe the importance of indicators, and avoids deviations caused by human factors to a certain extent. Therefore, the level of GF and EHQD is measured by taking the entropy method.

4. Empirical analysis

Based on the econometric model constructed previously, a multiple regression model is used to test the impact of GF, urbanization and other macro-influencing factors on EHQD in Guizhou. The multiple regression results are shown in Table 1. In model (1), it can be seen that at the 1% significance level, the regression coefficient of the GF index on the EHQD index is significantly positive. The estimated results show that GF has a significant positive impact on EHQD. Three variables of government intervention, the level of industrialization and technological progress, are added to model (2). The estimated results reveal that GF, government intervention, the level of industrialization and technological progress have a significant positive impact on the high quality of the economy. Therefore, the empirical results show that GF can boost EHQD in Guizhou. The reason why GF can boost EHQD in Guizhou may be that Guizhou Province attaches great importance to the development of green finance and has applied for a green finance reform pilot zone. Green finance in Guizhou provides abundant funds for high-quality economic development, promoting green development, open development, coordinated development, shared development, and innovative development in Guizhou Province.

Table 1 Impact of GF on EHQD in Guizhou

Explained variable	Model (1)	Model (2)
GF	0.5235*** (9.47)	0.3425*** (3.47)
GOV		0.2333*** (3.46)
IND		6.37e-06** (2.40)
TI		0.0004*** (4.35)
_cons	0.0581***	-0.0786*
R2	0.8909	0.9685
N	13	13

5. Summary

This article constructs a comprehensive index system for GF and EHQD in Guizhou based on data from 2008 to 2020, uses the entropy method to calculate the comprehensive indicators for GF and EHQD, and then conducts evaluation and analysis. Using a multiple regression model to construct an impact model of Guizhou's GF in promoting EHQD, the study finds that Guizhou's GF

has a significant positive impact on EHQD. At the same time, government intervention, the level of industrialization and technological progress have a significant positive impact on EHQD.

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Supplementary Tables

S1 Index system for high-quality economic development

First level	Second level	Definition
Economic development momentum	Technological development	Number of high-tech enterprises Technological market turnover
	Human capital	Proportion of education expenditure in fiscal expenditure Proportion of people employed in high-tech industries to total employed people Proportion of people receiving higher education in the total population
Economic development structure	Industrial structure	Proportion of secondary industry in GDP Proportion of tertiary industry in GDP
	Urban-rural consumption structure	Proportion of per capita consumption level of urban and rural residents
	Financial structure	Proportion of deposit balance of financial institutions in GDP Proportion of loan balance of financial institutions in GDP
	International trade structure	Proportion of import and export volume in GDP
Economic development quality	Resources and environment	Industrial pollution control completed expenditures Domestic waste removal volume Wastewater treatment expenditure Green coverage rate of built areas Per capita public green space area
	Development of public facilities	Old-age dependency ratio Buses per 10,000 people Number of hospitals (hundred)

S2 Green finance index system

First level	Second level	Third level	Index definition
Green finance	Green credit	Proportion of interest expenditure of high-energy-consuming enterprises	Interest expenditure of high-energy-consuming enterprises above designated size / interest expenditure of industrial enterprises above designated size
	Green bonds	Proportion of market value of high-energy-consuming industries	A-share market value of enterprises in high-energy-consuming industries/ total A-share market value
	Green investment	Proportion of energy conservation and environmental protection expenditure	Energy conservation and environmental protection fiscal expenditure/ total fiscal expenditure
	Green insurance	Proportion of rural insurance scale Rural insurance loss ratio	Rural insurance income/ property insurance income Rural insurance expenditure/ agricultural insurance income