Study on the Impact of Green Finance on Regional Total Factor Carbon Productivity: Analysis of Spatial and Temporal Heterogeneity Based on Beijing-Tianjin-Hebei, Yangtze River Delta and Pearl River Delta Regions

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Keywords: Green Finance, Green Total Factor, Carbon Productivity, Group Regression, SBM-DDL, GML Index.

Abstract: Looking at his Beijing-Tianjin-Hebei, Yangtze River Delta to Pearl River Delta type regarding teacup as every prey. The total factor carbon productivity and the effect of green finance are measured using the GML index model with SBM directional distance function from 2011 to 2020 is analyzed by constructing indicators regarding the level of advancement in green financing and using group regression model. As a result of the total regression results, the results are displayed, green securities have a strong contribution to TFCP, and green securities and carbon finance have the strongest significant effect on TFCP in the region; green insurance has a more significant effect on TFCP in the Pearl River Delta region; green insurance and carbon finance have a stronger significant effect in the Yangtze River Delta region.

1 INTRODUCTION

The stage of China's economic development is shifting from one of rapid expansion to one of high-quality development. Promote China's economy to green, low-carbon, environmentally friendly direction to achieve benign development, to enhance the scale of economic growth efficiency has been the general trend. In the process of forming a strategic shift in the economic development model, green finance can build a bridge and link between economic development and environmental regulation; green finance promotes the allocation of financial resources toward environmental protection and enhances the ability of society to resist risks, while enhancing economic vitality for green industries. The total factor carbon productivity (TFCP) index includes carbon emissions as an input variable, which can reveal the impact of a country's (region's) resource endowment on carbon productivity. Under the current national goal of "carbon neutrality" and "carbon peaking", it is significant to investigate the TFCP. As a result, researching the interactions between green finance and TFCP is critical to the high-quality development of the green economy. As the three major urban agglomerations in China, Beijing-Tianjin-Hebei region (**Region I**), Yangtze River Delta (**Region II**), and Pearl River Delta (**Region III**), it is of exemplary significance to investigate the effect of green finance on TFCP and the spatial variability over time.

Considering how green finance is developing at the moment, five products are selected as explanatory variables, and relevant data are collected for 10 years from 2011 to 2020 for three regions with intensive economic development for measurement and evaluation; meanwhile, the non-radial and non-angle SBM-DDL model is used to measure and analyze the TFCP of the three regions. Finally, a group regression model is constructed using the measured TFCP to examine spatial and temporal heterogeneity of green financial development on TFCP among the three regions.

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2 LITERATURE REVIEW

2.1 Research on Green Finance on Total Factor Productivity

At present, academics mainly study the drivers of TFCP. Different scholars have derived the influence of various factors on TFCP from environmental regulation (Chen Dongjing, Liu Kun 2022; Guo Weixiang, Sun Hui 2020), industrial structure (Hu Biqing 2019), foreign direct investment (Jin Shucheng 2022), and Internet development (Bai Xuejie; Sun Xianzhen 2021).

In addition, some researchers also focus on the impact of developing green finance on TFCP and GTFP: Shu Taiyi (2022) analysis of the impact of green funding on TFP from 2011 to 2019 using a fixed-effects model, and green finance had a significant contribution to GTFP under the fixed-effects model; Zhang Yuan(2022) empirically analyzed by building a panel model and using the level of economic development to determine how green finance affects GTFP for heterogeneity analysis, the mechanism of green finance on green total factor productivity is examined. The findings reveal that there is a significant regional heterogeneity between green finance and GTFP. Pengfei Ge (2018) et al found that there are different non-linear relationships between financial scale, structure, efficiency and deepening and GTFP; Ziju Yin (2021) et al discovered that the geographical structure of green finance and GTFP development in China was "high in the east," "flat in the center," and "poor in the west." "Cheng Gui et al (2022) found that there is a significant non-linear relationship between green financial development and GTFP. There are differences in curve shape, inflection point and the moment when different provinces cross the inflection point between groups, and green finance cannot effectively encourage the development of GTFP enhancement early on, and the relationship curve shows a significant U-shaped characteristic.

2.2 On the Measurement of TFCP

TFCP covers both desired and undesired outputs, and its comprehensive consideration of economic and environmental benefits seeks the organic coordination of economy and ecology. In the face of the increasingly serious environmental problems and urgent economic development transformation in recent years, how to accelerate the green development is a hot topic of discussion in academic circles.

Regarding the measurement of TFCP, most of the domestic and international studies focus on the optimization of measurement indicators and improvement of measurement methods. In terms of the selection of measurement indicators, energy, labor, and capital inputs are mostly used as input variables, while outputs are mostly expressed in terms of gross national product. For carbon dioxide emissions, some scholars include them as input variables (Zhang Lifeng 2013; Li Yinrong 2020). Some scholars include it in non-desired outputs into the measurement system to reduce the bias of production efficiency caused by undesirable outputs (Li Bo et al.2016 ; Chen Dongjing, Liu Kun 2022) include CO^2 emissions in non-desired indicators for TFCP measurement; there are differences between the two in the perspective of TFCP: the former will emit a certain amount of CO^2 to produce a certain amount of output and benefits on The former analyzes carbon dioxide emissions to produce output and benefits; the latter analyzes input factors to produce carbon dioxide emissions; although the research perspectives are different, there are achievements in theoretical research. In terms of TFCP measurement method, Zhang Lifeng (2013) for the first time used the DEA method to measure the Malmquist index. Subsequent scholars have continuously improved and refined this method: Dongjing Chen and Kun Liu (2022); Yifei Liu and Kai Wang (2022) used the Super-SBM model with non-expected output for measurement; Xuejie Bai and Xianzhen Sun (2021); Wenjing Gao et al (2018) used the Global Malmquist-Luenberger index method based on the SBM directional distance function for measurement.

3 MATERIALS AND METHODS

3.1 TFCP Measurement Method

For the measurement of TFCP, academics usually use the DEA method to measure productivity change using Malmquist index (Zhang Lifeng 2013), but this method cannot include non-desired output into the model; CHUNG Y, FÄRE R (1997) further extended this method to form the Directional distance function (DDF), which can include both desired and non-desired output in a certain period.

Directional distance Function (DDF), which can include both desired and non-desired outputs and be widely used to measure total factor productivity for a certain period of time, but this method has certain shortcomings and cannot effectively overcome the problem of linear programming nonsolutions and measurement bias caused by the different selection of radial or angular directions. The GML index was introduced by OH (2010) to address this issue; subsequent scholars further optimized the non-radial, non-angle function model by combining the SBM directional distance function with the GML index (Fukuyama et al. 1997); some scholars in the measurement of TFCP and GTFP also Some scholars also followed this method in measuring TFCP and GTFP (Xiang Yang 2015, Teng Zewei 2017, Liu Zhang-sheng 2017). Therefore, in this paper, the GML index is chosen to measure TFCP.

Considering each province as a decision making unit (DMU) separately, each province uses N inputs $x = (x_1, \ldots, x_N) \in R_N$ to produce M desired outputs $y = (y_1, \ldots, y_M) \in R^+_M$ and I non-desired outputs $b = (b_1, \ldots, b_I) \in R_M$ at each period t = 1, ... , T the kth k = 1, ... , T the kth k = 1, ... , the inputs and outputs of the K provinces are $(x^{k,t}, y^{k,t}, b^{k,t})$. Construct the set of production possibilities containing desired and undesired outputs.

$$P^t(x) = \{(y^t, b^t) : \sum_{k=1}^{K} z_k^t y_{km}^t \geq y_{km}^t, \forall m; \sum_{k=1}^{K} z_k^t b_{ki}^t \geq b_{ki}^t, \forall i; \sum_{k=1}^{K} z_k^t x_{kn}^t \leq x_{kn}^t \leq x_{kn}^t, \forall n; \sum_{k=1}^{K} z_k^t = 1, z_k^t \geq 0, \forall k\} \quad (1)$$

Where Zrepresents the weight of each cross-sectional observation. In some cases,the production of P(x) will regress. Based on this problem, Oh (2010) created a list of potential worldwide productions, which has improved the consistency and comparability of the production frontier.

$$P^G(x) = \{(y^t, b^t) : \sum_{t=1}^{T}\sum_{k=1}^{K} z_k^t y_{km}^t \geq y_{km}^t, \forall m; \sum_{t=1}^{T}\sum_{k=1}^{K} z_k^t b_{ki}^t \geq b_{ki}^t, \forall i; \sum_{t=1}^{T}\sum_{k=1}^{K} z_k^t x_{kn}^t \leq x_{kn}^t, \forall n; \sum_{t=1}^{T}\sum_{k=1}^{K} z_k^t = 1, z_k^t \geq 0, \forall k\} \quad (2)$$

Directional distance function for the SBM. based on Fukuyama's et al (1997) construction of the SBM directional distance function considering the resource environment, the global SBM directional distance function is obtained from the ideas of Yang Xiang (2015) in carbon productivity measurement as

$$S_V^G(x^{t,k'}, y^{t,k'}, b^{t,k'}, g^x, g^y, g^b) = \max_{s^x, s^y, s^b} \frac{\frac{1}{N}\sum_{n=1}^{N}\frac{s_n^x}{g_n^x} + \frac{1}{M+1}\left(\sum_{m=1}^{M}\frac{s_i^b}{g_m^y}\right)}{2}$$

$$S.t. \sum_{t=1}^{T}\sum_{k=1}^{K} z_k^t x_{kn}^t + s_n^x = x_{k'}^t, \forall n; \sum_{t=1}^{T}\sum_{k=1}^{K} z_k^t \quad (3)$$

$$y_{km}^t - s_m^y = y_{k'm}^t, \forall m; \sum_{t=1}^{T}\sum_{k=1}^{K} z_k^t b_{ki}^t + s_i^b = b_{k'i}^t, \forall i;$$

$$\sum_{k=1}^{K} z_k^t \geq 0, \forall k; s_n^x \geq 0, \forall n; s_m^y \geq 0, \forall m; s_i^b \geq 0, \forall i$$

where $(x^{t,k'}, y^{t,k}, b^{t,k'})$ denotes the input and output vectors for province k′ and (s^x, s^y, s^b) denotes the vectors of input and output slack. (g^x, g^y, g^b) denotes the directional vectors of desired output expansion, undesired output and input compression taking positive values.

The GML index, since the Malmquist-Luenberger index is often not cyclic and there is an unsolvable linear programming nonsolution problem, constructs the GML index built with SBM directional distance function according to Oh (2010) and Yang Xiang (2015) with the following equation.

$$GML_t^{t+1} = \frac{1 + S_V^G(x^t, y^t, b^t; g^x, g^y, g^b)}{1 + S_V^G(x^{t+1}, y^{t+1}, b^{t+1}; g^x, g^y, g^b)} \quad (4)$$

The change is represented by the GML index. in period t + 1 relative to period t. Whenever the index exceeds 1, it means that TFCP has an upward trend; conversely, if it is less than 1, it means that TFCP has a downward state; if it is equal to 1, it means that TFCP is in a largely steady condition. The GML index, however, is not similar because it measures how time t + 1 changed from period t, therefore, before the analysis, it is converted into a cumulative index by drawing on the methods of Qiu Bin et al (2008) and Li Bin (2013), if the TFCP in period 1 is 1, then the TFCP in period t + 1 is:

$$GTFP_{t+1} = GML^{t+1}{}_t \cdot GTFP_t \quad (5)$$

3.2 Input and Output Indicators Selection and Data Description

(1) Input indicators: labor input, fixed asset input and energy input are selected as input indicators. For labor input, most of the existing studies use the year-end employment number of each province to characterize, and this paper also continues this idea. For fixed asset inputs, the permanent inventory method (PIM) proposed by Goldsmith. The following formula is used to calculate each province's productive capital stock:

$$K_t = K_{t-1}(1-\delta_t) + I_t \quad (6)$$

(2) Output indicators: for desired output, the nominal GDP of each province is used to characterize; for non-desired output, carbon dioxide emissions are used to characterize, and carbon emissions are measured using the IPCC method with the following model equation.

$$C=\sum_i E\times\frac{E_i}{E}\times\frac{C_i}{E_i} \quad (7)$$

3.3 Analysis of TFCP Measurement Results

The results of TFCP measurement in three regions from 2011 to 2020 are obtained by using MATLAB software and expressed by GML cumulative index, as shown in Figure 1. In the long term, the TFCP of the three largest urban areas in China is steadily increasing and the growth rate has been increasing, which indicates that the green economic development of the three regions in China has achieved significant results. However, the GML index decreased in the period of 2012-2015 compared with that of 2011 and 2012. The reason for this phenomenon may be that the control on the use of fossil energy such as coal and the supervision and management of heavy industrial industries were effective at the early stage of policy promulgation, but there were problems of lax supervision and lack of systematic and effective management in the subsequent development. Therefore, in the subsequent development the government and other business sectors should increase the supervision of environmental protection to achieve a balance between the improvement of production and living standards and carbon emissions.

From the comparison of the three regions, the GML accumulation index of the three major urban clusters shows a pattern of "Region III > Region II > Region I". The GML accumulation index of Beijing-Tianjin-Hebei region is fluctuating in the past ten years and has been declining since 2017, while the GML index of Tianjin is the smallest in most years, contributing the least to the GML accumulation index and lagging behind in relative terms; the GML accumulation index of Yangtze River Delta and Pearl River Delta region are both on a stable upward trend, and the development speed of Pearl River Delta is faster than that of Yangtze River Delta. It may be due to the rapid development of high-tech in Guangdong Province, especially in Shenzhen and Guangzhou, which provides technical support and financial guarantee for industrial green development, coupled with the inclined support of national policies, so the PRD region has been in the front line of green economic development.

4 EMPIRICAL ANALYSIS OF THE IMPACT OF GREEN FINANCE ON REGIONAL TOTAL FACTOR CARBON PRODUCTIVITY

4.1 Model Setting and Variable Selection

In order to investigate how regional TFCP is affected by green funding, a mixed OLS model (8) is used as the benchmark regression equation for establishing panel data.

$$TFCP_{it} == \alpha 1 + \beta 1 digitfin_{it} + \varepsilon_{it} \quad (8)$$

In this model, the explanatory variable $TFCP_{it}$ is the regional TFCP, the core explanatory variable $digitfin_{it}$ is the degree of regional green finance development, and εit is a random disturbance term.

To investigate the spatial differences of green finance on TFCP, i.e., the effects of green finance in three regions on TFCP among the three regions, models (9), (10), and (11) are developed to conduct heterogeneity analysis of the structure of the core explanatory variables, respectively.

$$TFCP_{it} == \alpha 2 + \beta 2 digitfin_{it} + \varepsilon_{it} \quad (9)$$

$$TFCP_{it} == \alpha 3 + \beta 3 digitfin_{it} + \varepsilon_{it} \quad (10)$$

$$TFCP_{it} == \alpha 4 + \beta 4 digitfin_{it} + \varepsilon_{it} \quad (11)$$

The explanatory variables and control variables of models (9)-(11) are the same as the model, and the subscripts i and t of the variables in the above model denote province and time

Table 1: Descriptive statistics for variables.

Variable type	Explained variable	Explanatory variable				
Variable name	Total Factor Carbon Productivity	Green credit	Green securities	Green investment	Green insurance	Carbon finance
Sample size	70	70	70	70	70	70
Maximum value	1.448	0.615	0.3	0.003	9.171	0.003
Minimum value	0.758	0.192	0.012	0	0.067	0.002
Mean	1.03	0.392	0.088	0.001	1.841	0.009
Standard deviation	0.153	0.111	0.057	0.001	2.111	0.006
Median	1.007	0.348	0.084	0.001	0.665	0.008

4.2 Data Sources

In this paper, the panel data of region I,region II, region III from 2011 to 2020 are selected as the research samples. The relevant data are mainly obtained from the statistical yearbooks of each province. Missing data are supplemented by interpolation method for completeness. respectively, and εit is a random disturbance term.

Baseline regression

The regression results of model (8) are shown in Table 2

Table 2: Linear regression analysis results.

	Standardized coefficient	t	P	VIF	R^2	Adjustment R^2	F
	Beta						
Constants	-	20.527	0.000***	-	0.488	0.448	F=12.186 P=0.000***
Green credit	-0.111	-0.899	0.372	1.904			
Green securities	0.384	3.042	0.003***	1.996			
Green investment	-0.257	-2.415	0.019**	1.418			
Green insurance	-0.715	-6.736	0.000***	1.408			
Carbon finance	-0.502	-2.769	0.007***	4.106			

The analysis of the results of the F-test can be obtained that the significance P-value is 0.000***, Therefore, the model basically meets the requirements. The t-statistics of four indicators, namely, green securities, green investment, green insurance and carbon finance, are significant, indicating that their effects on TFCP are more significant.

The standardized coefficient of green securities is 0.384, which indicates that green securities have a positive effect on TFCP; meanwhile, the standardized coefficients of green investment, green insurance and carbon finance are all negative, which indicates that these three green financial products have a negative effect on TFCP.

2. Heterogeneity analysis

The grouped regression results of models (9) to (11) are shown in Table 3.

Table 3: Regression results for subgroups.

	Overall	Region I	Region II	Region III
Constants	1.267*** (20.527)	1.013*** (15.998)	0.772 (1.474)	1.488*** (3.953)
Green Credit	-0.153 (-0.899)	-0.079 (-0.791)	-0.744 (-0.318)	0.783 (1.073)
Green Security	1.035*** (3.042)	0.809*** (5.003)	3.568 (0.672)	-0.122 (-0.062)
Green Investment	-67.556** (-2.415)	-7.923 (-0.509)	-242.515 (-1.108)	-67.649 (-1.286)
Green Insurance	-0.052*** (-6.736)	-0.007 (-0.925)	1.043* (2.652)	-0.108*** (-5.769)
Carbon Finance	-12.377*** (-2.769)	-4.695** (-2.089)	33.121 (0.538)	-55.301*** (-3.884)
Sample size	70	30	10	30
R^2	0.488	0.548	0.940	0.687
Adjustment R^2	0.448	0.454	0.866	0.621
F	F (5,64)=12.186,p=0.000	F (5,24)=5.816,p=0.001	F (5,4)=12.644,p=0.015	F (5,24)=10.514,p=0.000

The p-values of the three regions were compared by F-test and were significant at the degree of confidence of 95%, indicating that green finance has a significant contribution to TFCP in three regions. Further analysis shows that green securities and carbon finance have the strongest significant effect on TFCP in Beijing-Tianjin-Hebei region; green insurance has a more significant effect on TFCP in the Pearl River Delta region; green insurance and carbon finance have a stronger significant effect in the Yangtze River Delta region. and the standardized coefficients of each indicator in Beijing-Tianjin-Hebei and Yangtze River Delta regions are consistent with the overall model, while the standardized coefficients in the PRD region differ slightly, which may be due to too little data.

Table 4: Regression coefficient variance test.

Name	Item 1	Item 2	b1	b2	Difference	t	p
Green Credit	Region I	Region III	-0.079	-0.744	0.665	2.117	0.041**
	Region I	Region II	-0.079	0.783	-0.862	-2.289	0.028**
	Region III	Region II	-0.744	0.783	-1.527	1.857	0.072*
Green Security	Region I	Region III	0.809	3.568	-2.759	-11.588	0.000***
	Region I	Region II	0.809	-0.122	0.931	-3.896	0.000**
	Region III	Region II	3.568	-0.122	3.690	-1.953	0.056
Green Investment	Region I	Region III	-7.923	-242.515	234.592	1.089	0.281
	Region I	Region II	-7.923	-67.649	59.726	1.460	0.150
	Region III	Region II	-242.515	-67.649	-174.866	10.268	0.000***
Green Insurance	Region I	Region III	-0.007	1.043	-1.050	7.692	0.000***
	Region I	Region II	-0.007	-0.108	0.101	-1.742	0.090
	Region III	Region III	1.043	-0.108	1.151	1.241	0.222

Name	Item 1	Item 2	b1	b2	Difference	t	p
Carbon Finance	Region I	Region III	-4.695	33.121	-37.816	-0.589	0.560
	Region I	Region II	-4.695	-55.301	50.605	5.439	0.000***
	Region III	Region II	33.121	-55.301	88.421	3.721	0.001***

Table 5: Results of robustness test.

Name	Region I	Region II	Region III
Constants	0.958**(12.563)	1.368**(3.217)	0.889(1.645)
Credit	-0.059 (-0.587)	1.055(1.396)	-3.402(-1.646)
Security	0.651**(3.086)	0.030(0.014)	6.899(1.382)
Investment	0.803(1.082)	-0.516(-0.094)	-3.289(-0.844)
Insurance	-0.004(-0.590)	-0.111**(-4.553)	1.371*(2.850)
Carbon Finance	-3.446(-1.349)	-58.136**(-3.651)	115.943(1.515)
Sample size	30	30	10
R^2	0.564	0.665	0.934
Adjustment R^2	0.473	0.595	0.852
F	F (5,24)=6.215, p=0.001	F (5,24)=9.532, p=0.000	F (5,4)=11.322, p=0.018

By comparing the differences in regression coefficients among the three regions, the regions and variables that are significant in each region are bolded, as shown in Table 4. According to the chart, It is possible to draw the following conclusions: the effect of green credit and green investment on the TFCP of the three regions is not significant; green securities bring a greater impact effect in Region I, and their p-values are more significant compared with the Region II and Region III, with greater spatial heterogeneity; green insurance has a strong significance in the Region III and theRegion II; the p-values of the Region III compared with the Region I are heterogeneous at the p-value in the PRD region is heterogeneous at 90% confidence level compared to the Region I, while the heterogeneity is not significant compared to the Region II, indicating that the effect level of green insurance scale on TFCP is not much different between the two regions. Carbon finance has a strong heterogeneity in Region I,Region II, Region III.

3.Robustness test

By referring to the test method of grouped regression by Chang-Rong Wu et al (2022), this paper performs robustness test by replacing the indicators of explanatory variables.

The amount of money invested in reducing environmental pollution and the amount of money spent on energy efficiency and environmental protection are some of the development indicators of green investment; the development indicators of green credit include the proportion of agricultural insurance scale and agricultural insurance payout rate . And the indicators of agricultural insurance payout rate were removed from the stepwise regression after the strong covariance problem of the variables. Therefore, the core explanatory variables in the baseline regression models (9) to (11) were replaced with the share of fiscal spending on environmental preservation, energy efficiency, and a new regression with three regional groupings was conducted, and the obtained results are shown in Table 5. The F-test shows that the overall regression effect of each region is still significant, and a comparison with Table 2 reveals that this is generally agreeable to the outcomes of the benchmark regression model (9) in terms of the core explanatory variables; indicating that the econometric model and regression results of this study have high reliability and robustness.

5 RESEARCH CONCLUSIONS AND COUNTERMEASURE SUGGESTIONS

5.1 Research Conclusions

First, at the overall level, the four indicators of green securities, green investment, green insurance and carbon finance have a significant effect on TFCP in the three regions, and green credit has no significant effect on its impact. Among them, green securities have a positive promoting effect on TFCP, while the other three indicators have a negative hindering effect on TFCP. It may be because green finance, in promoting the flow of capital in the market, both increases carbon emissions in the production process and generates economic benefits at the production end. The economic benefits generated by green securities are the strongest in the capital flow, and the capital flows more to the high-end production end, and the economic benefits generated are greater than the impact brought by carbon emissions; while the production end to which the capital flows such as green insurance, green investment and carbon finance are more to the primary production end, and the reasons for the capital flows are mostly policy-driven factors, and the economic benefits brought are less than the impact of carbon emissions.

Second, at the regional level, the positive contribution of green securities to TFCP in Beijing-Tianjin-Hebei region is more obvious than other two regions, probably because in recent years, Beijing-Tianjin-Hebei region has been promoting green transformation in various industries, increasing green financial expenditures, and taking a number of practical actions to implement the national energy conservation and emission reduction policies, in addition to the joint hosting of the 2022 Winter Olympics. In addition, the joint hosting of the 2022 Winter Olympics by Beijing and Zhangjiakou has also contributed to the green transformation and upgrading of the region's industries. Green insurance has a more obvious and significant effect on TFCP in both the PRD and the Yangtze River Delta, while the impact of carbon finance on TFCP varies greatly among the three regions, and the possible reason for the variability is the imbalance of economic strength and technological innovation capacity.

5.2 Suggestions for Countermeasures

The following recommendations are provided for the growth of green finance and the enhancement of TFCP based on the research findings mentioned above.

First, the three major city clusters, especially the Yangtze River Delta, should take the initiative and fully utilize the benefits of industrial agglomeration to take the lead in achieving a sustainable and steady growth of total factor carbon productivity, and at the same time, they can also play a radiating effect to drive other regions to make a rapid change to high-quality economic development, while paying attention to the balance between the speed of economic development and the utilization of environmental resources.

Secondly, strengthen top-level design, enhance regional synergy and linkage across provinces and cities, strengthen information sharing between regions, promote the construction of green financial standard system, increase the scale share of agricultural insurance, improve the innovation capacity of financial industry, and promote TFCP.

Finally, improve and perfect the relevant rules and regulations, strengthen the supervision and management of high energy consumption, high pollution, low value-added industries, and promote the green transformation and modernization of industry; can further encourage collaboration between educational institutions and businesses., increase the financial and policy support for research institutes and universities as well as the environmental research enterprise sector, train innovative and complex talents, and promote technological innovation to help the development of green economy.

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