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An Empirical Study on Influencing Factors of Green Economic Development in Chengdu-Chongqing Twin Cities

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Abstract: *Under the background of green economic development, new quality productivity is the key to solve the problems of cities, industries and even foreign trade faced by the development of Chengdu-Chongqing twin cities. This study is committed to identifying the core new quality productivity of Chengdu-Chongqing area and exploring its mechanism of action with green economic development. This paper adopts the empirical research method, takes the new quality productivity as the independent variable, green economic development as the dependent variable, and adopts the entropy weight method to obtain the green economic development index of Chengdu-Chongqing regions. It constructs a database based on the public data of the government such as statistical year and adopts the machine learning methods such as regression analysis and gradient lifting analysis to conduct quantitative research. The research shows that the full-time equivalent of research and development (R&D) personnel, the number of high-tech enterprises, the sales revenue of new products and the number of green invention patent applications are the keys to green economic development. In the future, scientific and technological innovation and personnel training, regional coordinated development and industrial transformation and upgrading should be coordinated to promote green economic development in Chengdu-Chongqing region.*

Keywords: *Chengdu-Chongqing twin cities; New quality productivity; Green economic development*

1. Introduction

The new productivity is the result of technological revolution, innovative allocation of production factors, and in-depth industrial transformation and upgrading, which significantly improves total factor productivity. The development of green economy emphasizes the shift from speed orientation to quality, green and low-carbon development, and the pursuit of quality and sustainable development.In Chengdu-Chongqing economic circle, the development of new productive forces is the key to promote the development of green economy. It is necessary to seize the opportunities of scientific and technological revolution and industrial transformation, strengthen scientific and technological innovation, foster emerging industries, promote the transformation of traditional industries, improve the modern industrial system, and drive the green economy with new productive forces [1]. However, there are still challenges in urbanization, industrial structure and foreign trade in the region, such as low level of urbanization, large regional differences, imperfect industrial chain, weak cooperation between enterprises, and insufficient development of foreign trade [2].

Therefore, it is very important to identify the core elements of new productive forces in Chengdu-Chongqing area and their mechanism of action with economic green development. The purpose of this study is to quantitatively analyze the contribution of each factor of new productivity to the economic green development of Chengdu-Chongqing twin City economic Circle, explore its influence mechanism, and provide ideas for the overall progress and green development of the region.

In this study, machine learning models such as linear regression, random forest and gradient lift tree were adopted. Firstly, linear regression was used to explore the linear relationship between economic green development and new productivity factors, and then random forest and gradient lift tree were used to deal with complex nonlinear relationships and interactions, and mutually verify and optimize the analysis results. This study has theoretical significance for the assessment of the development status of Chengdu-Chongqing economic circle and the future green development planning.

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2. Literature Review

2.1. Definition and Measurement of Economic Green Development

There are many studies on green economic development with diverse perspectives. Green economic development is not only about a certain product or service standard meeting the international advanced level, but also about the entire supply system being dynamic, effective and of high quality[3]. The essence of green economic development is inclusive development, which can be summarized as making the best use of people, things and land[4]. Green economic development can be combined with the new development concept and studied from the five dimensions of innovation, coordination, green development, openness and sharing[5].

The measurement methods of economic green development are strongly related to the new development concept. Some have scientifically defined the connotation of economic green development from the perspective of the new development concept, and based on the principles of constructing the evaluation index system, have constructed a multi-level and multi-dimensional comprehensive evaluation index system for the economic green development of the Chengdu-Chongqing region. Then, they have selected indicators from the existing comprehensive evaluation index system, and finally established a comprehensive evaluation index system from the five levels of innovation, coordination, green, sharing, and openness[6]. Some have grasped the connotation of urban economic green development based on the five major development concepts, and constructed an urban economic green development evaluation index system that includes input, expected output, and non-expected output[7]. Some have constructed an evaluation index system for the level of economic green development of urban agglomerations based on the new development concept, and used the CRITIC-entropy weight method and kernel density estimation method to measure the level of economic green development[8]. These measurement methods are the basis for further empirical research in this paper.

2.2. Definition and Measurement of New Quality Productivity

New quality productivity is a strategic concept, which refers to all economic activities that can promote the improvement of the technological content and added value of unit products based on technological progress. There are abundant theoretical research results on its connotation, characteristics, and improvement paths. First, scientific and technological innovation is the primary connotation of new quality productivity and the core of academic research. That is, new quality components can act on the means of production and affect production efficiency by directly changing the production process, and can also act on workers and indirectly affect production efficiency by improving labor skills[9]. Secondly, cultivating and improving new quality productivity requires adjusting the unreasonable factors in the existing production relations, releasing the momentum of productivity development through systematic reform, strengthening the construction of the innovation system with unique institutional advantages, promoting the development of industrial clusters through spatial layout optimization, and creating a good innovation ecology through social environment construction to help the formation and development of new quality productivity[10].

At present, the research on the measurement method of new quality productivity is relatively flexible. Some people have constructed a comprehensive evaluation index system of new quality productivity from the two dimensions of entity and permeability[11]; some people have constructed a new quality productivity evaluation index system covering three dimensions of new industry, new model and new momentum, and then calculated the overall index through the entropy weight method[12]; some people have constructed a measurement index system of regional new quality productivity level in my country based on new manufacturing, new services, new formats and comprehensive indicators [13]; some people have constructed a new quality productivity development evaluation index system covering four dimensions of new quality talent resources, new quality science and technology, new quality industrial form and new quality production mode, and examined the development level, regional gap and dynamic law of China's new quality productivity [14].

Although existing research tends to focus on theoretical discussions on the connotation and extension of new quality productivity and the path of improvement, the research on the measurement method based on the connotation of new quality productivity is deepening, which lays a foundation for the quantitative indicators of the subsequent empirical research of this article.

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3. Research Design

The research area of this paper is the Chengdu-Chongqing Economic Circle, and the research objects include 16 prefecture-level cities including Chongqing, Chengdu, Zigong, Mianyang, Luzhou, Leshan, Yibin, Suining, Nanchong, Dazhou, Meishan, Ziyang, Guang'an, Neijiang, Deyang and Ya'an.

According to the literature review, this study extracted four types of research variables as shown in Table 1. The relevant data of the selected variables are sufficient and highly accessible. The data sources include but are not limited to the "Sichuan Statistical Yearbook", "Chongqing Statistical Yearbook", "China Energy Statistical Yearbook", "China High-tech Industry Statistical Yearbook", "China Environmental Statistical Yearbook", etc. Public statistical data and reports are also downloaded from official government websites and industry association websites. Relevant research data are extracted by collecting annual reports and financial reports of enterprises in the Chengdu-Chongqing Twin Cities Economic Circle.

The data statistics of this article cover a total of five years of panel data from 2018 to 2022. A cross-sectional study is used within the time range instead of a longitudinal study, that is, the mean value is processed for the 5-year research data, and the data does not reflect major changes over a period. Data preprocessing includes three steps: data cleaning, data sorting and conversion, and data verification. A few missing values are filled by interpolation.

Table 1: Variable Description

Variable	Dimensionality	Quantitative Index	
New Driving Force	Innovation-driven	A1	Number of College Students Per 10,000 (person)
		A2	Research and Development (R&D) Personnel Full-time Equivalent (person-years)
		A3	R&D Expenditure (100 million RMB)
		A4	Number of Scientific Research Institutions (unit)
		A5	Number of Valid Invention Patents Granted (unit)
		A6	Amount of Technology Loan from Financial Institutions (10 ,000 RMB)
		A7	Technology Market Turnover (100 million RMB)
New Industry	Emerging Industry	B1	Number of High-tech Enterprises (unit)
		B2	Number of Specialized New Enterprises (unit)
		B3	New Product Sales Revenue (100 million RMB)
	Future Industry	B4	Number of Artificial Intelligence Patent Applications (unit)
New Pattern	Digitization	C1	Employees in Information Transmission, Software and Information Services (10,000 people)
		C2	Development Level of Digital Economy
		C3	E-commerce Sales (10 thousand RMB)
		C4	Number of Digital Technology Patent Applications (unit)
	Greenization	C5	Number of Green Invention Patent Applications (unit)
		C6	Increase or Decrease in Energy Consumption by Gross Regional Product (equivalent value)
Input	Human Capital	D1	Number of Employees in the Whole Society (10,000 people)
	Energy Consumption	D2	Increase or Decrease in Energy Consumption per Unit Value Added of Industrial Enterprises above Designated Size (equivalent value)
	Physical Capital	D3	Urban Capital Stock (100 million RMB)
Expected Output	Innovation Level	D4	Regional Innovation and Entrepreneurship Index
	Coordination Level	D5	Per Capita Disposable Income of Urban Residents (RMB)
		D6	Real GDP (100 million RMB)
	Opening Level	D7	Number of Beds in Hospitals (sheet)
	Sharing Level	D8	Total Imports and Exports /GDP
		D9	Per Capita Disposable Income of Rural Residents
Unexpected Output	Green Development Level	D10	Urban Industrial CO2 Emissions (10,000 tons)
		D11	Industrial Smoke (dust) Emissions (10,000 tons)
		D12	Sewage Discharge (tons)

This paper uses SPSS 26 and SPSSpro to process the data. First, the CRITIC-entropy weight method is used to analyze the weights of the 12 dimensions included in the green development of the economy to simplify the analysis; then linear regression is used to explore the data relationship between new quality productivity and green development of the economy; finally, the gradient boosting model is used to verify the data analysis results of the regression model. The training data accounts for 0.6, and the

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five-fold cross-validation method is used for data verification. The number of machine learners is 100, the learning rate is 0.1, the minimum number of samples for internal node splitting is 2, and the minimum number of samples for leaf nodes is 1.

4. Empirical Analysis

To simplify economic and green development and facilitate analysis, the critical-entropy weight method is adopted to analyze the weights of 12 dimensions contained in it, and the calculated results show the weights of each dimension, as shown in Table 2. The results showed that the maximum weight of the index was the number of hospital beds (42.362%), and the minimum weight was the ratio of total import and export to GDP (0.0%).

Table 2: Weight Calculation Result

Item	Indicator Variability	Indicator Conflict	Information Amount	Weight (%)
D1	423.072	3.253	1376.112	0.3
D2	3.49	11.302	39.444	0.009
D3	13576.813	3.079	41797.053	9.113
D4	13.146	4.933	64.852	0.014
D5	2856.58	4.989	14250.67	3.107
D6	3249.763	3.079	10007.343	2.182
D7	59599.533	3.26	194302.452	42.362
D8	0.07	3.031	0.212	0
D9	2414.335	7.693	18572.861	4.049
D10	2.011	5.769	11.601	0.003
D11	1.657	5.586	9.253	0.002
D12	54699.49	3.259	178244.7	38.861

4.1. Regression Model Analysis Data Analysis Method

As table 3 shown, the constant value is 0.258, the standard error is 0.003, the T value is 92.278, and the significance level is extremely low ($p<0.00000$), indicating that the intercept term is important in statistics is significant, which means that when all independent variables are 0, the basic level of the Chengdu-Chongqing economic green development index is 0.258; the coefficient of the number of college students per 10,000 people is -0.009, the standard error is 0.004, and the Beta coefficient is -0.042, the T value is -2.153, and the significance level is 0.057 (close to the significance level 0.05), indicating that the number of college students has an insignificant impact on the economic green development index; research and development (R&D) personnel are full-time The equivalent coefficient is 0.578, the standard error is 0.104, the Beta coefficient is 2.682, the T value is 5.576, and the significance level is extremely low ($p<0.00000$), indicating that the full-time equivalent of R&D personnel has a significant positive impact on the economic green development index; The coefficient of R&D investment intensity is - 0.455, the standard error is 0.149, the Beta coefficient is -2.111, the T value is -3.063, and the significance level is 0.012, indicating that the intensity of R&D investment has a significant negative impact on the economic green development index; The coefficient of science and technology loans of financial institutions is 0.192, the standard error is 0.086, the Beta coefficient is 0.893, the T value is 2.243, and the significance level is 0.049 (close to the significance level of 0.05), indicating that the science and technology loans of financial institutions have an important impact on the economic green development index. There is a positive effect, although this effect is slightly marginal statistically; for technology market turnover, the coefficient is -0.142, the standard error is 0.035, the Beta coefficient is -0.657, the T value is -4.003, and the significance level is 0.003. It shows that technology market turnover has a significant negative impact on the economic green development index. The formula $Y=0.258+0.578A2-0.455A3+0.192A5-0.142A6$ is obtained.

Table 3: Regression Analysis Model of Driving Force and Economic Green Development

	B	Standard Error	Beta	T	Significance
Constant	0.258	0.003		92.278	0.00000
A1	-0.009	0.004	-0.042	-2.153	0.05700
A2	0.578	0.104	2.682	5.576	0.00000
A3	-0.455	0.149	-2.111	-3.063	0.01200
A5	0.192	0.086	0.893	2.243	0.04900
A6	-0.142	0.035	-0.657	-4.003	0.00300

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In Table 4, the constant value is 0.258, the standard error is 0.006, the T value is 43.322, and the significance level is extremely low (p<0.00000), indicating that the intercept term is in statistics is highly significant, which means that when all independent variables are 0, the basic level of the Chengdu-Chongqing economic green development index is 0.258; the coefficient of employees in the information transmission, software and information service industry is 0.061, and the standard error is 0.025. The Beta coefficient is 0.284, the T value is 2.474, and the significance level is low (p<0.05), which shows that the number of employees in the information transmission, software and information service industries has a significant positive impact on the economic green development index; professional The coefficient of the number of specialized new enterprises is -0.043, the standard error is 0.026, the Beta coefficient is -0.2, the T value is -1.639, and the significance level is 0.129 (not significant), which means that the number of specialized new enterprises has increased. It has no significant positive or negative impact on the economic green development index; the new product sales revenue coefficient is 0.1, the standard error is 0.011, the Beta coefficient is 0.462, the T value is 8.665, and the significance level is extremely low (p<0.00000) , new product sales revenue has a significant positive impact on the economic green development index, and the degree of impact is relatively large; the digital economy development level coefficient is 0.107, the standard error is 0.026, the Beta coefficient is 0.494, and the T value is 4.124, which is significant The level of security is low (p<0.005). The improvement of the development level of the digital economy has a significant positive impact on the economic green development index, and the degree of impact is the largest among the B series independent variables. The formula Y=0.258+0.061B1+0.1B2+0.107B4 is obtained.

Table 4: Regression Analysis Model of New Industries and Economic Green Development

	B	Standard Error	Beta	T	Significance
Constant	0.258	0.006		43.322	0.00000
B1	0.061	0.025	0.284	2.474	0.03100
B2	-0.043	0.026	-0.2	-1.639	0.12900
B3	0.1	0.011	0.462	8.665	0.00000
B4	0.107	0.026	0.494	4.124	0.00200

In Table 5, the constant value is 0.258, the standard error is 0.008, and the T value is 33.727, which is highly significant (p<0.00000), which shows that the intercept term is statistically highly Significant, meaning that when all independent variables are 0, the basic level of the economic green development index in the Chengdu-Chongqing region is 0.258; the coefficient of e-commerce sales is 0.333, the standard error is 0.088, the Beta coefficient is 1.545, and the T value is 3.797 , highly significant (p<0.005); the coefficient of the number of digital technology patent applications is -0.377, the standard error is 0.113, and the Beta coefficient is -1.752 (similarly, the absolute value of the Beta coefficient is large, but the interpretation needs to be cautious), and the T value is -3.342, highly significant (p<0.005), which means that the increase in e-commerce sales did not have a significant positive impact on the economic green development index, but had a significant negative impact; economic green development patent application The numerical coefficient is 0.277, the standard error is 0.033, the Beta coefficient is 1.288 (the size of the Beta coefficient indicates its relative importance in the model), and the T value is 8.344, which is highly significant (p<0.00000), which indicates that economic green development patents The number of applications has a significant positive impact on the economic green development index of the Chengdu-Chongqing region. The formula is Y=0.258+0.333C3-0.3777C4+0.277C5.

Table 5: Regression Analysis Model of the New Model and Economic Green Development

	B	Standard Error	Beta	T	Significance
Constant	0.258	0.008		33.727	0.00000
C3	0.333	0.088	1.545	3.797	0.00300
C4	-0.377	0.113	-1.752	-3.342	0.00600
C5	0.277	0.033	1.288	8.344	0.00000

According to the analysis results of the above regression model, all the three hypotheses proposed in this paper are partially valid, and the research results of the linear regression model are shown in Figure 1. The influencing factors on the economic green development in Chengdu-Chongqing area are sorted according to the size of the coefficient, which are the full-time equivalent of research and development (R&D) personnel, e-commerce sales, green invention patent applications, effective invention patent grants, artificial intelligence patent applications, new product sales revenue, and the number of high-tech enterprises. Among them, the investment intensity of R&D funds, the amount of scientific and technological loans of financial institutions and the number of digital technology patent applications has a negative impact on economic green development, which conflicts with the original hypothesis. The specific reasons will be further analyzed in the following paragraphs.

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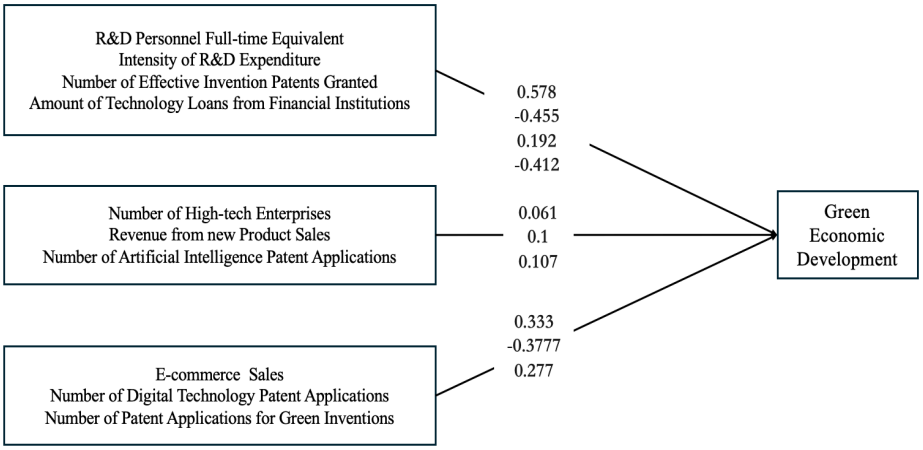

Figure 1: Research Result

4.2. Gradient Lifting Model Analysis

Table 6: Evaluation of Gradient Lifting Model

	MSE	RMSE	MAE	MAPE	R^2
Training Set	0	0	0	0.001	1
Cross Validation Set	0.027	0.087	0.068	25.541	
Test Set	0.001	0.037	0.025	8.931	0.971

The gradient boosting model shown in Table 6 performed almost perfectly on the training set, showing extremely high prediction accuracy (R^2 close to 1, and other error indicators close to zero), indicating that the model can fully learn the pattern of the training data. However, on the cross-validation set, although the model performance is still acceptable, the error indicators (such as RMSE, MAE, MAPE) increase significantly, showing a certain risk of overfitting or limited generalization ability to new data. On the test set, the model maintains good prediction ability (R^2 is 0.971), and the error index is also relatively low, indicating that the model is highly adaptable to new unseen data and is overall an efficient and robust prediction model.

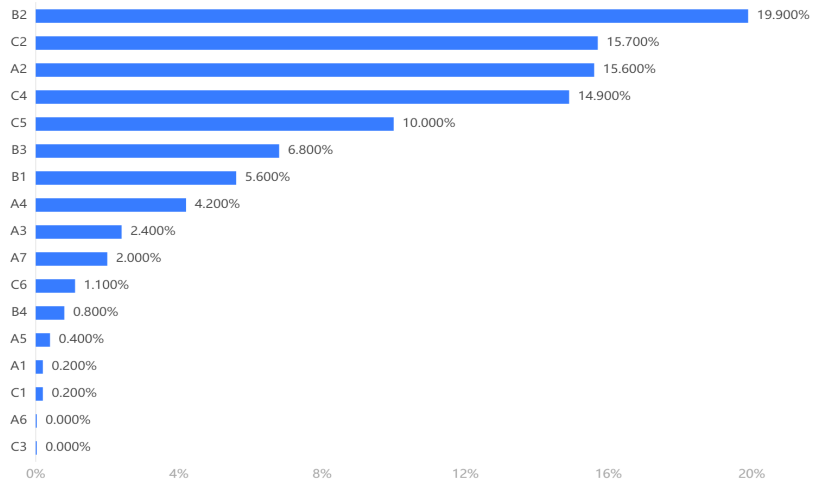

Figure 2: Ranking the Importance of Independent Variable Features

According to the model training results (Figure 2), for the green development of the Chengdu-Chongqing region, the number of specialized, sophisticated and innovative enterprises, the level of digital economic development, the full-time equivalent of research and development (R&D) personnel, the number of digital technology patent applications, the number of green invention patent applications, new product sales revenue, the number of high-tech enterprises and scientific research institutions are the core strengths.

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5. Discussion

According to empirical analysis, the green development of the Chengdu-Chongqing economic circle is significantly affected by four major factors: full-time research and development equivalent, the number of high-tech enterprises, new product sales revenue and the number of green invention patent applications. R&D talents are the core of scientific and technological innovation and promote regional technological progress; high-tech enterprises optimize the industrial structure and promote economic growth; new product sales revenue reflects market demand and promotes industrial upgrading; green patents reflect the government's determination to support green development. The regression model reveals linear relationships, such as the number of valid invention patents, AI patent applications, and e-commerce sales. The gradient boosting model is good at handling non-linear relationships and identifying more complex patterns, such as scientific research institutions, specialized and new enterprises, digital economic development and digital patents, etc. It is worth noting that R&D funding intensity, technology loans and digital patents have a negative impact on green development in some cases, which may be related to the efficiency of fund allocation, the lagging effect of R&D activities or insufficient patent conversion. These issues require further research and discussion to optimize resource allocation and promote green and sustainable development of the Chengdu-Chongqing economic circle.

The study found that Chengdu and Chongqing are leading in the development of green economy in the Twin Cities Economic Circle, but regional development imbalance may exacerbate the imbalance of green economic development. The two places face homogeneous competition and resource and environmental pressure. The study found that the number of college students, R&D funding intensity, and number of employees in the information service industry in the new momentum, new industry, and new model have not been fully utilized. The reasons may include the mismatch between education and industrial demand, insufficient R&D investment intensity, and industrial structure problems. Further research is needed to verify these views.

In view of the above analysis, this paper believes that the Chengdu-Chongqing economic circle needs to coordinate and promote the linkage between new quality productivity and economic green development. This paper suggests that we should strengthen scientific and technological innovation and talent training, increase investment in scientific research, improve intellectual property protection, improve the efficiency of science and technology utilization, and adjust the structure of higher education to meet industrial needs. We should promote regional coordinated development, narrow the development gap, avoid homogeneous competition, clarify the positioning of each city, strengthen industrial cooperation, and form an internationally competitive industrial cluster. We should accelerate the development of the digital economy, develop green technologies, promote the digital transformation of traditional industries, and increase investment in green technology research and development. In general, Chengdu-Chongqing development should give priority to quality, formulate a scientific policy system, strengthen fiscal and taxation financial support, establish an economic green development monitoring and evaluation system, and ensure the effective implementation of policies.

6. Conclusions

This study focuses on the development of green economy in Chengdu-Chongqing economic Circle, builds a multidimensional new productivity system including innovation-driven, emerging industries, future industries, digitalization and greening, and uses machine learning models such as linear regression and gradient lifting tree to analyze the panel data from 2018 to 2022. It is found that R&D full-time equivalent, high number of enterprises and new product sales significantly promote green development; Effective invention patent licensing, AI patents, e-commerce sales, etc., also have an impact. In the future, we can deepen data breadth, evaluate policy effects, cross-boundary research and regional comparative analysis, and continuously optimize the quality of new productivity.

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References

[1] Yang B, Li L. Research on the main problems and countermeasures faced by the development of the Chengdu-Chongqing Twin Cities Economic Circle [J]. Commercial Economy, 2021, (01): 20-22.
[2] Sun J. Experience, shortcomings and future direction of green economic development in the Chengdu-Chongqing Twin Cities Economic Circle [J]. New West, 2024, (02): 85-89.
[3] Wang J. Green economic development promotes economic construction in the new era [J]. Southern Economy, 2017, (10): 1-2.
[4] Zhao D. Thoughts and suggestions on achieving green economic development [J]. Economic Research Reference, 2018, (01): 7-9+48.
[5] Lv P. Research on the measurement and evaluation of China's economic green development [D]. Yunnan University, 2019.
[6] Ding S., Ye J., Li R. Level measurement and spatiotemporal evolution of urban economic green development [J]. Statistics and Decision, 2024, 40 (12): 98-102.
[7] Kang R. Research on the construction and measurement of the index system based on the green development of Chengdu-Chongqing economy [D]. Chongqing University, 2021.
[8] Bu W., Liu S., Li C. Measurement and comparison of the level of green development of the economy of the three major urban agglomerations [J]. Statistics and Decision, 2024, 40(12): 103-107.
[9] Yu Y., Bai B., Chen S., et al. Research on the connotation feature mining of new quality productivity based on large language model [J/OL]. Modern Intelligence, 1-15 [2024-07-26].
[10] He C. New quality Productivity: Theoretical Origin, Thinking Direction and Improvement Path [J]. Jiangnan Forum, 2024, (06): 4-9.
[11] Wang G., Guo W. Measurement of China's New Productivity Level and Its Impact on the Green Development of the Economy [J/OL]. Financial Development Research, 1-11 [2024-07-26].
[12] Liu J., Yan J., Wang H., et al. Level Measurement and Difference Analysis of New Productivity in Major National Strategic Regions [J/OL]. Journal of Chongqing University (Social Science Edition), 1-12 [2024-07-26]
[13] Shi X., Yu Zh. Measurement, structural decomposition and spatial convergence analysis of regional new productivity level in my country [J]. Industrial Technology and Economics, 2024, 43(05): 90-99.
[14] Wu J., Wan X. Measurement, regional gap and dynamic law of development level of new productivity in China [J]. Technology and Economics, 2024, 43(04): 1-14.