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Research on Regional Economic High-quality Development Along the Belt and Road of China

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Abstract: Over the past 40 years of reform and opening up, China's economy has developed rapidly and made remarkable achievements. China has become the second largest economy in the world. But behind the high investment, high consumption and high growth, the quality problems of economic growth such as excessive consumption of energy, deterioration of environmental quality, imbalance of economic structure and widening income gap are gradually prominent. In 2018, General Secretary Xi Jinping called for high-quality belt and Road cooperation as a basic requirement for the next stage. "The Belt and Road" is an important regional development in China, and the study of its high-quality economic development level can provide an important basis and reference for the national high-quality economic development research. Therefore, it is of great significance to explore the high-quality economic development level of provinces and regions along the "Belt and Road" and clarify the current orientation of high-quality economic development for deepening opening-up, innovative development and sharing the fruits of development with the people. Global principal component analysis (pca), this paper calculates the inter-provincial economic development level of high quality composite scores, the clustering analysis, variation coefficient, thayer index method, such as in China during 2008-2017 "neighbourhood" all the way along the route 17 provinces and autonomous regions for evaluation and analysis, from the Angle of time sequence, regional perspective and dimension to analyze the differences, In order to analyze the high-quality economic development level of provinces and regions along the Belt and Road in a more comprehensive way, 17 provinces and regions are divided into different types.

Keywords: The Belt and Road Initiative, Provinces along the line, High-quality economic development, Evaluation index system.

1. Introduction

Since the Belt and Road Initiative was put forward in 2013, the overall layout of pillars and beams has been completed, opening a new chapter in China's opening-up and development. At the 2019 Belt and Road Forum for International Cooperation, General Secretary Xi Jinping clearly stated that high-quality construction of the Belt and Road should be identified as the core content of future cooperation, thus the Belt and Road has entered a new stage of high-quality construction. China's high-quality development includes the high-quality economic development of provinces and regions along the Belt and Road as an important component. China's economy has entered a critical moment from high-speed development to high-quality development. High-speed economic development reflects the rapid growth of the quantity economy as the leading, to solve the shortage problem, while high-quality development pays more attention to the good of development. It shows that China's economic development keeps up with the trend of The Times, and provides a reference for improving the quality of the national economic development level, as well as for better cooperation with other countries. The economic development of provinces and regions along the Belt and Road in China shows that the development is still not coordinated, and the eastern coastal areas have significant advantages in economy, society and resources. Due to geographical factors, the development level of the western region is relatively backward, but due to the implementation of the western development policy, there are signs of improvement. The old industrial areas in the northeast began to decline under the downward pressure of the market economy. Therefore, by analyzing the high-quality economic development level of provinces and regions along the "Belt and Road" in China, we have a profound understanding of the current economic development status of provinces and regions along the "Belt and Road" in China, and sort out the existing but unexplored advantages and disadvantages of each region, providing certain reference value for the study of other regions in China.

2. Study Design

2.1. Index System Construction

The Belt and Road Initiative has promoted increasingly frequent trade cooperation at home and abroad, driving rapid economic integration and development. In order to study the high-quality economic development of provinces along the "Belt and Road", this paper designs the evaluation index system of high-quality economic development from the relationship between five development concepts and the results of previous studies, and takes innovation, coordination, green, open and sharing as the first-level indicators of high-quality development. Indicators are selected from these five dimensions to construct an indicator system, including 12 second-level indicators and 21 third-level indicators, as shown in Table 1 on the following page.

Table 1. Index System of High-quality Economic Development

Target level	Control layer	Indicator level	Indicator measurement	unit	efficacy
Economic innovation and development	Innovation input	R&D funding intensity	R&D expenditure as a percentage of GDP	%	+
		R&D personnel commitment	R&D personnel FTE/population	%	+
	Innovation output	Ten thousand patents granted	The number of three domestic patents granted	Item/ten thousand people	+
		Percentage of technology market turnover	Technology market turnover /GDP	%	+
	Innovation benefit	Increased profitability of innovative products	Product revenue/revenue from main business	%	-
		High-tech income generation	Sales revenue /GDP	%	-
Coordinated economic development	Urban-rural coordination	Coordination level of urban and rural income	Urban-rural income ratio	%	-
		Coordination level of urban and rural consumption	Urban-rural consumption level ratio	%	-
	Regional coordination	Urbanization rate	Permanent urban population/total population	%	+
	Industrial structure coordination	rationalize the structure of production	theil index	%	-
Green development of economy	energy consumption	energy consumption per unit of gdp	Total energy consumption /GDP	Ten thousand tons of standard coal/ten thousand yuan	-
	Pollution discharge	Emissions per unit of GDP	Sulphur dioxide emissions /GDP	Tons/ten thousand yuan	-
		Solid waste emissions per unit of GDP	Solid waste production /GDP	Tons/ten thousand yuan	-
		Wastewater discharge per unit GDP	Wastewater discharge /GDP	Tons/ten thousand yuan	-
	Greening and environmental protection	Garbage harmless treatment rate	statistical data	%	+
		forest coverage rate	statistical data	%	+
Economic opening and development	foreign trade	foreign trade dependence degree	Total imports and exports /GDP	%	+
		Foreign trade openness	Total foreign investment /GDP	%	+
	Open tourism	Tourism openness	Foreign exchange income from international tourism /GDP	%	+
Shared economic development	social welfare	Urban and rural old-age insurance coverage	Insured persons/total population	%	+
		Unemployment insurance coverage	Number of unemployed insured/unemployed	%	+
	input in education	Library per capita	statistical data	Books/pieces	+
		expenditure on education	Per capita expenditure on education	%	+
	income level	per capita disposable income	statistical data	Yuan/person	+
	medical service	Number of health technicians per thousand population	statistical data	human	+
		1,000 beds	statistical data	Per thousand people	+

2.2. Evaluation Method

In this paper, the principal component analysis method is more suitable to determine the weight. However, since the principal component analysis method is only for planar data tables, while this paper is for panel data, it needs to combine with time series in the traditional method, so the global principal component analysis method is used to make the comprehensive analysis results more scientific and reliable. Global principal component analysis (GPCA) is to add time series on the basis of traditional PRINCIPAL component analysis (PCA). The data of each province are smoothly formed into a global data table according to time, and the PRINCIPAL component analysis is carried out by USING SPSS software. The calculated results can be compared both vertically and horizontally in time. In this study, panel data from 2008 to 2017 of 17 provinces and cities along the belt and Road in China were selected to conduct global principal component analysis.

The scores of each principal component are

: $F_k = \sum_{i=1}^{p} u_i x_i (k = 1,2 \cdots, m)$

The variance contribution rate corresponding to each principal component is

:$Q_k = \partial_k = \beta_i / \sum_{i=1}^{p} \beta_i \ (k = 1,2, \cdots, m)$

The product of the corresponding weight of each component and the score of each principal component, namely, the comprehensive score is

: $F = \sum_{k=1}^{m} Q_k F_k$

This paper plans to take the relevant data of 18 provinces and cities along the Belt and Road in China as research samples. Due to difficulties in data acquisition in Tibet Autonomous Region, data of some indicators cannot be collected or the year data is incomplete, so it is considered to remove them. "The Belt and Road" was proposed in 2013. This paper intends to study the changes in the level of high-quality economic development of "The Belt and Road" before and after it was proposed. Therefore, the research period of this paper is from 2008 to 2017.

2.3. The Evaluation Process

1. Establish a global data table. Organize the panel data of 17 provinces and 26 indicators from 2008 to 2017 into a global data table for high-quality development evaluation. Firstly, the time series data are standardized and processed by SPSS21.0 software.

2. the KMO and Bartlett Secondly, KMO test and Bartlett sphericity test were carried out. SPSS21.0 software was used to test the output results, which showed that the KMO test of all dimensions of high-quality economic development was larger than the significance level of 0.5, and the Bartlett sphericity test passed the significance level, that is, global principal component analysis was adopted. The test results are shown in the table 2.

Table 2. KMO and Bartlett Sphericity Tests

dimension	KMO value	Bartlett's Test of Sphericity		
		Approximate chi-square	Df (degree of freedom)	Sig.(p value)
novelty	0.780	984.434	21	0
harmony	0.585	201.902	six	0
Greenness	0.573	500.033	15	0
openness	0.721	336.838	six	0
Sharing	0.546	534.793	21	0

3.In this paper, there are 26 indexes to extract principal components and variance contribution rate, so it is more appropriate to select the method with eigenvalue greater than 1. By extracting principal components with eigenvalue greater than 1, the characteristic values and variance contribution rate of each dimension index are obtained (Table 3). As can be seen from the table, the characteristic values of the five dimensions are within 2, and the cumulative variance contribution rate is between 60% and 70%.

Table 3. Global Eigenvalues and Variance Contribution Rates of Principal Components

dimension	component part	eigenvalue	Contribution rate of variance (%)	Cumulative Variance Contribution Rate (%)
Innovative	1	4.436	63.368	63.368
	2	1.160	16.565	79.934
harmony	1	2.170	54.249	54.249
Greenness	1	2.939	48.987	48.987
	2	1.270	21.159	70.146
openness	1	2.693	67.333	67.333
Sharing	1	2.783	39.751	39.751
	2	1.621	23.156	62.907

4.The component score coefficient matrix is calculated by the component matrix, and the numerical value (load number) in the component matrix is divided by the arithmetic square root of the eigenvalue of each principal component. The variance contribution rate can be regarded as the weight of different principal components. Therefore, the score of the basic indicator can be regarded as the variance contribution rate of each principal component as the weight, and the score of each basic indicator can be obtained by weighted average of the score coefficient of each indicator component, as shown in Table 4.

Table 4. Each basic index score.

Basic indicators		Basic indicator score
Innovative development	R&D funding intensity	0.356
	R&D personnel commitment	0.226
	Ten thousand patents granted	0.338
	Percentage of technology market turnover	0.186
	Increased profitability of innovative products	0.341
	High-tech income generation	0.358
coordinated development	Coordination level of urban and rural income	-0.566
	Coordination level of urban and rural consumption	0.622
	Urbanization rate	0.519
	rationalize the structure of production	-0.153
Green development	energy consumption per unit of gdp	0.383
	Emissions per unit of GDP	0.367
	Solid waste emissions per unit of GDP	0.321
	Wastewater discharge per unit GDP	0.410
	Harmless Treatment Rate of Domestic Waste	0.158
	forest coverage rate	0.034
open development	foreign trade dependence degree	0.553
	Openness of foreign investment	0.525
	Tourism openness	0.537
shared development	Urban and rural old-age insurance coverage	-0.215
	Unemployment insurance coverage	0.223
	Library collections per capita	0.417
	Proportion of Education Expenditure to Fiscal Expenditure	-0.022
	per capita disposable income	0.403
	Number of health technicians per thousand population	0.299
	1,000 beds	0.113

5.The scoring load of the SPSS result show dimension indicators, divided by the principal component of the eigenvalues of the arithmetic square root, it as the main component in an expression of each index factor, multiplied by the standardization of the original value, respectively, by the principal component expression, and then to the variance contribution rates of the principal component to the weighted average of principal component scores, dimensions can be obtained index score.

6.After calculating the comprehensive score and determining the score of the five dimensions of high-quality economic development, they are used as variables to conduct the second step of global principal component analysis, and pass the KMO and Bartlett sphericity test to extract the two principal components. The comprehensive score of high-quality economic development can be obtained by using the above steps, as shown in Table 5.

3. Results Analysis

There are many provinces involved along the Belt and Road in China, and the geographical factors lead to great differences between provinces. Therefore, it is more meaningful to divide the 17 provinces into regions and conduct separate research according to each region. Therefore, according to the regional division in general geographical sense, 17 provinces and regions are divided into southeast coastal region, southwest region, northwest region and northeast region. Inner Mongolia Autonomous Region belongs to North China in strict sense, but due to the limitation of regional division, Inner Mongolia Autonomous Region is temporarily changed into northwest region. Shanghai, Zhejiang, Fujian, Guangdong and Qiong belong to the southeast coastal region; Liao, Kyrgyzstan and Heihe belong to the northeast region; Guangxi, Chongqing and Yunnan belong to the southwest region; Inner Mongolia, Shaanxi, Gansu, Qing, Ning and Xin belong to the northwest region. This section analyzes the level of high-quality economic development from both intraregional and interregional perspectives.

Table 5. Overall score

Provinces and autonomous regions	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Inner Mongolia	-1.897	-1.593	-1.563	-1.547	-0.897	-1.174	-1.003	-0.874	-0.632	-0.463
Liaoning (Province)	-0.457	-0.482	-0.155	-0.102	0.683	0.516	0.547	0.638	0.911	1.211
Jilin (Province)	-0.815	-0.527	-0.736	-0.781	-0.134	-0.341	-0.255	-0.020	0.387	0.481
Amur	-1.051	-0.993	-0.774	-0.752	-0.401	-0.431	-0.210	-0.071	0.112	0.317
Shanghai	4.137	4.420	4.679	4.395	3.844	5.200	5.306	5.557	6.329	7.704
Zhejiang	0.385	0.498	0.880	1.335	1.663	2.060	2.325	2.687	3.014	3.505
Fujian	-0.301	-0.123	0.063	0.381	0.695	0.791	1.015	1.219	1.587	1.939
Guangdong	1.395	1.455	1.774	2.054	2.305	3.137	3.014	3.900	4.536	5.668
Guangxi	-1.801	-1.664	-1.558	-1.385	-0.897	-0.847	-0.629	-0.435	-0.142	0.223
Hainan	-0.523	-0.422	-0.279	-0.200	-0.313	0.203	0.285	0.444	0.864	1.054
Chongqing	-1.048	-0.992	-0.827	-0.633	0.102	0.253	0.719	0.927	1.301	1.702
Yunnan	-2.094	-1.997	-1.862	-1.912	-1.844	-1.450	-1.211	-0.956	-0.752	-0.437
Shaanxi	-1.690	-1.386	-1.114	-1.099	-0.466	-0.531	-0.198	0.072	0.276	0.625
Gansu	-2.261	-2.337	-2.227	-2.319	-2.124	-2.167	-1.757	-1.565	-1.376	-1.102
Qinghai	-2.409	-2.533	-2.309	-2.344	-1.618	-2.223	-1.993	-1.741	-1.564	-1.386
Ningxia	-2.147	-2.085	-1.809	-1.813	-1.306	-1.127	-0.826	-0.720	-0.591	-0.293
Xinjiang	-1.767	-1.798	-1.407	-1.514	-1.189	-1.331	-0.893	-0.982	-0.881	-0.723

Southeast coastal belong to economic, social, environmental and other relatively developed area, in addition to fujian, hainan omit below average by 2013, the rest of the provinces are higher than average, and present a rising trend, that "area along the southeast coast" regional economic development level of high quality is outstanding, this is consistent with its economic development level. Among them, the high-quality economic development level of Shanghai has always been in the first place from 2008 to 2017, and far ahead of other provinces in the southeast region. It only declined in 2012, and recovered its growth momentum after 2013. It can be seen that The high-quality economic development level of Shanghai is relatively high, with outstanding economic, social, environmental and other aspects. 10 years in zhejiang province and guangdong province's economic development level of high quality has been in a steady growth trend, the high quality and economic development of guangdong province level is always higher than that of zhejiang province, this accords with the actual situation of guangdong province, in the recent 5 years in zhejiang province's economic development by leaps and bounds, with high quality in zhejiang province with the focus on green development, healthy development to have a lot to do. The high-quality economic development level of Fujian province was always lower than the average level before 2009, and higher than the average level after 2010, with a fast growth rate. The high-quality economic development of Hainan province was at the lowest level, but in 2013, as a node, the high-quality economic development level turned positive and steadily increased, indicating that the high-quality economic development of Hainan province around 2013 had a significant positive impact after the proposal was put forward.

The high-quality economic development level of the three northeastern provinces shows an upward trend of fluctuation, but the overall level is not high. Liaoning province, which has shown great advantages in the past 10 years, is in the leading position. After 2012, it is higher than the average level and grows steadily. While jilin province and Heilongjiang Province have seen some growth in their high-quality economic development, but the growth rate is relatively slow, and they are all below the average level before 2015. As the three provinces in northeast old industrial base of China in recent years the development speed is slow, face of talent loss, lack of innovation, resource depletion, single industrial structure, the National Development and Reform Commission issued concerning economic development and reform policy in 2016, has significant effect to promote the quality and economic development, since 2016 in figure in the three provinces of northeast synthetically score can validate the knot Theory.

The high-quality economic development level of the three southwest provinces shows an overall growth trend. Chongqing has a more prominent development trend and has significant advantages compared with the other two provinces. After 2012, It took the lead to be higher than the average level and the fastest growth rate, which is inseparable from the development situation of Chongqing in recent years. Due to its geographical advantages and being a municipality directly under the Central Government, Chongqing has shown a higher level in economy, science and technology, as well as shipping and logistics compared with surrounding areas, so its high-quality economic development level is in a leading position in the western region. Sleep and belongs to the southwest of guangxi and yunnan provinces, its development level is inferior to the chongqing, serious pollution, such as the gap between rich and poor big problem is outstanding, the guangxi economic development level is slightly better than that of yunnan province, with high quality to achieve above average in 2017, yunnan has been below average standard, it has a lot to do with the geographical location of yunnan, in the south of China, all around is relatively poor The country, development is lagging behind.

Six provinces of northwest present a low economic development level of high quality, but has the tendency of growth, the most prominent development in shaanxi province, has obvious advantages compared to other provinces and regions, 2015 years after the first is higher than the average

and steady growth, this has to do with China (shaanxi) is closely related to the free trade area was set up, as the only experimental zone, free trade in northwest in deepening reform, expanding in an all-round way Major achievements have been made in opening up, accelerating the Belt and Road Initiative and deepening the large-scale development of the western region. Compared with Shaanxi Province, the high-quality development level of other provinces and cities in northwest China develops slowly. In particular, the high-quality economic development level of Gansu province and Qinghai Province is in a backward position. It has been kept at a low level before 2014 and showed an increasing trend after 2015. Generally northwest area and other area, show a disadvantage, although in recent years in the west is the relevant policy, such as the western development, accelerate the development of the western region, promote the region economy coordinated development has the vital significance, but in the western region conditions and scarce resources still exist, such as short board is still in the early stages of development, it is a long and difficult Historical task, need to continue efforts.

4. Countermeasure and Suggestion

This paper evaluates the high-quality economic development level of provinces and autonomous regions along China's "the belt and road initiative", and the results show the following problems: the innovation development and opening development of provinces and autonomous regions along China's ""are slow; The high-quality economic development in southeast coastal areas is quite different from other areas. To provide a basis for promoting the high-quality development of the belt and road initiative's economy, thus improving the level and quality of economic development, the following countermeasures and suggestions are put forward.

(1) Intensify the implementation of innovation drive, accelerate the conversion of kinetic energy, and build "the belt and road initiative" with innovative thinking. From the above analysis, it can be seen that the innovation and development capability of each region shows that the growth of southeast region is weak and stagnant, while the innovation capability of other regions is insufficient and lacks innovation. This is closely related to the current situation of China's economic development. The driving force of innovation is insufficient, and it is impossible to master the core technologies. In the process of high-quality economic development, innovation drive is always in an important position. It is necessary to stimulate the innovation ability of the eastern region to drive the scientific and technological innovation of the western region. Create innovative development channels, and encourage innovation and entrepreneurship by means of "internet plus" in combination with the rapidly developing science and technology and financial industries. In the process of open cooperation, we are good at integrating the development advantages of other countries, inspiring innovative development ideas, and striving to transform Chinese manufacturing into Chinese intellectual manufacturing.

(2) Establish an open economic system, rationally plan the regional spatial layout, and focus on supporting areas with extremely low openness. From the above analysis, it is known that the level of opening-up development of provinces along the route is growing slowly, and the gap between the four regions is also obvious. Therefore, the following suggestions are suggested: First, under the condition of national opening-up strategy, seize the opportunity to carry out in-depth cooperation with other countries, and expand opening-up to establish a sound economic system; Secondly, the state should pay more attention to the western provinces and autonomous regions in major investment projects, guide qualified large enterprises to invest, provide preferential financial policies, make full use of the abundant resources in the western region, change development ideas, and promote the overall high-quality development of the provinces and autonomous regions along the "the belt and road initiative"; Finally, the state should focus on supporting the less open areas in the west, giving various policy subsidies, focusing on the complementary resources of various provinces and regions, and exerting the superposition effect of "1+1>2" to promote the coordinated development and development of provinces and regions along the "the belt and road initiative".

(3) Strengthen multi-field cooperation with other countries. We will cross-integrate the spirit of China's excellent traditional culture with the civilization construction of other countries, enrich and strengthen the connotation of building "the belt and road initiative", and let more countries participate in it. China should adopt the exchange policy for international students from countries along the "the belt and road initiative" to promote cultural exchange and integration, and at the same time strengthen the development of tourism industry.

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