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A New Supply Chain and Sustainable Development Mechanism of Guangdong under the Framework of RECP

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Abstract

This article takes the theory of regional economic development as the research perspective and uses relevant economic indicators to analyze the differential performance of the coordinated development of the regional economy in Guangdong Province under the RCEP framework from two aspects, including static and dynamic aspects. Subsequently, the regional economic development in Guangdong Province is analysed, in terms of its industrial layout of the coordinated economic development, logistics and transportation network. Secondly, based on the regional economic theory, this paper further analyses the crux of the uncoordinated regional development of Guangdong Province, and finally put forward the countermeasures and suggestions to promote the coordinated development of Guangdong Province. This paper is to strengthen and consolidate the interconnection of regional supply chains, promote institutional opening, improve the level of trade and investment facilitation, form a regional economic layout with complementary advantages and high-quality development, which is the core hub of RCEP, together with accelerating the high-quality development of East Asian economies, and promoting China's domestic and international with construction of a new dual-cycle development pattern.

Keywords: Sustainable Development, Institutional Mechanism, Industrial Supply Chain, Regional Economic Theory

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Introduction

This paper mainly studies the coordinated development of Guangdong, China, which is located at the core of the geographic scope of the RCEP Free Trade Zone. Firstly, the growth pole theory, sustainable development theory, gradient transfer theory and other related theories of regional economic development were combed, laying a theoretical foundation for the full context of the current study. Secondly, based on the Guangdong Provincial Statistical Yearbook data, the comprehensive development process of the regional economy was analysed, by virtue of statistical description and analysis of the main economic indicators of Guangdong Province's GDP, GDP per capita, disposable income of urban residents per capita, as well as disposable income of rural residents per capita, so as to explore the dynamic evolution trend of development differences. Thirdly, this paper summarized the industrial layout and characteristics of the logistics and transportation network of the regional economic development in Guangdong Province, in terms of analysing the location resources, economic policies, technological innovation, industrial structure and other factors that affect the coordinated development of Guangdong Province, aiming to break through the development bottleneck, and thus make up for the shortcomings of the industry with an effective path. Finally, a path was proposed for the coordinated development of the regional economy in Guangdong Province from the aspects of taking advantage of Guangdong Province's "dual-node" location, digital economy & speed economy, as well as strategic industrial clusters.

Thanks to the past 4 decades of reform and opening up policy, Guangdong's economy has rapidly developed, in that its comprehensive economic strength has ranked first in the country, and its economic aggregate has ranked first in the country for 32 consecutive years. However, at the same time, the development of various regions in Guangdong Province has shown great imbalance and uncoordinated development, which is manifested in the continuous expansion of the development gap between regions at the spatial level, as well as the unsustainable regional economic development mode at the time level. The issue of regional economic incoordination has gradually become an important factor restricting both of the economic and social development of Guangdong Province. Guangdong Province, the vanguard, bridgehead, pioneer area, and demonstration area of China's reform and opening up zone, is located at the "dual node" of the "Belt & Road" initiative and the new development pattern of the Guangdong-Hong Kong-Macao Greater Bay Area, so some vital issues are followed to be addressed, namely, how to seize the RCEP opportunities to promote coordinated regional economic development, enhance high-quality economic development, give full play to advantages, make up for shortcomings to seize opportunities, and how to deeply participate in the "Belt and Road". All those items are really worthy of our thinking and exploration.

There are many domestic and foreign studies on the mechanism and system of the coordinated development of regional economy. From the perspective of the research objects, there are studies mainly exploring the coordinated economic development mechanism between different regions of the whole country and between different regions within a certain region. For example, Xu (2018) studied the coordinated development mechanism of China's regional economy and concluded that we shall start with the economic operation mechanism for overall planning to promote the coordinated development of regional economy.

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Burenmende (2015) discussed the coordinated development of China's regional economy, coming up with the basic path and the long-term construction mechanism. Li (2018) discussed the influencing factors of the coordinated development of regional economy, and proposed the construction of regional economic coordination from the three aspects of optimizing the market competition mechanism and establishing the regional economic coordinated development mechanism. The second kind of research is to study the mechanism and path of the coordinated development of a certain industry and the regional economy. For example, Guo and Xu (2016) analyzed the influencing factors of the coordinated development of regional economy and technology finance, putting forward the idea of constructing a coordinated development model of regional economy and technology finance. She (2015) studied the region of Shandong Province concerning the relations between the policy of coordinated economic development and industrial proliferation. It is believed that the policy of coordinated development of regional economy should focus on “people” rather than “things”. Ng et al. (2016) analyzed innovation to promote inclusion in Southeast Asia, of which results showed that the regional coordination mechanism casts a huge potential role on development. From the perspective of research methods, some research studied the mechanism of coordinated development of regional economy via constructing an evaluation index system. For example, Wei (2018) systematically discussed the mechanism of coordinated development of China's regional economy from the aspects of the connotation, dynamic mechanism and evaluation indicators, standards and quantitative methods of the coordinated development of regional economy. Zhang et al. (2018) constructed an index system to study the coordinated development of the regional economy in Jiangsu Province from the three aspects of economic relations Intensity, overall economic efficiency, and economic development gap, so as to explore its dynamic mechanism. Zhang (2013) used a non-parametric DEA analysis method to study the Yangtze River Delta region, exploring the mechanism of economic convergence in terms of material capital accumulation, efficiency improvement, technological progress and human capital investment.

In recent years, with the development of economic globalization and economic integration, scholars have done more research on the coordinated development of regional economy. Yet, most of the existing relevant research literatures are focusing on the framework of RECP, with limited studies concerning the comprehensive, multi-level, and systematic analysis of the coordinated development of regional economy under the framework of regional economic theory. Besides, there are many documents that study the coordinated development of inter-regional economies while not many ones that study the coordinated development of the internal economy and relevant studies on the regional coordinated development of Guangdong Province in particular are very few, especially those taken into account Guangdong’s comprehensive strength of the research economy ranks in the forefront of China, and its important position in the cooperation framework. Third, there are relatively many documents to study the coordinated development of regional economy from the establishment of an evaluation system to measure the degree of regional development coordination, while the research on the unsustainable regional economic development mode from the static index analysis of the spatial level and the dynamic evolution analysis of the time level is so limited.

This paper mainly discussed the following three issues: First, based on the growth pole theory of regional economic development, sustainable development theory, gradient transfer theory and other related theories, it explored the connotation of the coordinated development of regional economy in the new era. Second, based on the statistical yearbook data of Guangdong Province, it conducted the static index analysis and explored the dynamic evolution trend of the coordinated development of the regional economy in Guangdong Province, followed by analysis of the factors that affect the coordinated development of the regional economy in Guangdong Province. Third, by combining the status quo of economic development in Guangdong Province, it studied the institutional mechanisms and effective paths to break through the development bottleneck and make up for the shortcomings of the industry.

The high-quality economic development of Guangdong Province is not only hinged on the total economic volume and its growth, but also includes the multi-dimensional measurement of economic efficiency, structure, stability, and sustainability. It is an evolutionary development under the coordination of both of the quantity and quality. The coordinated development of the regional economy is conducive to stimulating the new vitality of the open economy in Guangdong Province, promoting the rational flow and efficient agglomeration of elements, enhancing the motivation for innovation and development, promoting institutional opening, forming a regional economic layout with complementary advantages and high-quality development, and forming an economic globalization ultimately. Therefore, Guangdong Province shall seize the new opportunities brought by RECP, by innovating systems and mechanisms, to promote the coordinated development of the regional economy, accelerate the transition from rapid scale expansion to improved development quality and efficiency, so as to become the core hub of RCEP to promote China's construction of a new development pattern in terms of domestic and international "dual cycle".

Literature Review

Growth Pole Theory

The growth pole theory was first proposed by French economist Francois Perroux in 1950. The theory holds that economic development relies on regions with better conditions and strong innovation capabilities, large-scale, and dominant propelling & leading industrial sectors. Therefore, regions with better conditions and advantageous industries shall be turned into economic growth poles. The formation of growth poles tend to become and serve as the centre of regional economic growth. Although the economically underdeveloped places have abundant natural resources, their economic development is mostly in the primary stage of primary industry and manufacturing due to poor technical foundation, underdeveloped transportation, scattered population, and low degree of urbanization. Through the continuous development of the growth pole, the acceleration of the flow of commodities and resource elements will not only enable the economic development of the region, but also spread out via various channels, thereby driving the economic development of the surrounding regions. Hence, with the guidance of the growth pole theory, the essential process of regional development functions as the key of regional polarization and diffusion, and the method of regional planning is to promote the intensification and diffusion of regions with advantages in location and resource endowments.

Many scholars, recently, have used the growth pole theory to study regional economic policies. For example, Azizova et al. (2019) held that, in the process of inter-regional cooperation, the formation and effective operation of "growth points" were key tools for regional development policies. When resources and opportunities were limited, the possibility of applying the theory of "growth poles" was getting bigger. Rauhut and Humer (2020) studied EU cohesion policy and spatial economic growth, and their results suggested that there was a great overlap with Perroux's "growth pole theory". Xiang and Song (2017), studied the optimization of China's counterpart support policy based on the growth pole theory. In addition, many scholars used the growth pole theory to conduct research on industry-related issues. For example, Li and Sun (2017) studied the cultural industry development strategy of the Jingchu cultural circle based on the growth pole theory. Lee (2016) used the growth pole theory to analyze the social and cultural influence factors of tourism development.

Literatures above uses the Growth Pole Theory to propose relevant policies, development models, together with implementation paths, with a view to promoting economic growth in poverty-stricken areas from different angles and levels, which is conducive to the formation of inter-regional logistics integration & industrial agglomeration linkage, the promotion of the development of regional industrial chain clusters, as well as building a regional industrial linkage development pattern of "dislocated competition, point-to-face linkage, and complementary advantages".

Sustainable Development Theory

Sustainable Development Theory, taking fairness, sustainability, and commonality as its three basic principles, refers to development that not only meets the needs of contemporary people, but does no harm to the ability of future generations to meet their needs. In his book "Economy, Natural Resources: Deficiency and Development", Edivard B. Barbier defines sustainable development as "on the premise of maintaining the quality of natural resources and the services they provide, maximizing the net benefits of economic development." D-Pearce holds: "Sustainable development means that today's use should not reduce future real income", and "when development can maintain the welfare of the present generation, it will not reduce the welfare of future generations."

The theory of sustainable development is widely used in economics-related research, mainly including: those that studied the sustainable development planning and principles of the area, such as: Brais et al. (2019) put forward the operational principle of combining the sustainable development theoretical goals within the sustainable development framework with the actual implementation strategy. Zhang and Xiao (2019) took the Zhoushan Islands in eastern China as an example to study the island's sustainable development planning. Others built a sustainable development model to study the coordinated development of regional economies. For example: Li et al. (2019) constructed a regional agricultural sustainable development evaluation system based on the five elements of economy, society and environment. Empirical analysis was conducted and found that the level of sustainable agricultural development in Chengdu has been increasing year by year. Gong et al. (2019) established a measurement model of urban sustainable development, and studied the urban evolution trend of Chengdu of China, followed by measuring its coordinated development, and concluded that the

development level of the city has been continuously improved, and the coordination has continued to improve. Deng et al. (2017) have constructed an evaluation index system for economy, society, technology, resources and environment, and conducted an empirical analysis on the data of Sichuan Province from 2005 to 2015, of which results showed that the sustainable agricultural development system of Sichuan Province was moving towards a more orderly system.

It can be clearly seen that the sustainable development theory lays a theoretical basis for the study on the coordinated development of the regional economy. By virtue of applying the sustainable development theory, we can conclude that we shall focus on the sustainable, stable and healthy development of the "nature-economy-society" complex system in the aspect of economy. Quantitative growth is quite limited in that only on the premise of maintaining the quality of natural resources and their lasting supply capacity, relying on scientific and technological progress to improve the efficiency and quality of economic activities, can the Pareto optimality of resource allocation be truly achieved.

Gradient Transfer Theory

The gradient transition theory, originated from the Product Life-Cycle Theory, was proposed by Vernon L. Smith. The theory believes that each country or region is in a certain stage of economic development, and there are differences in innovation activities in different stages of economic development, which determines that regional development at a different level of gradient. High-gradient regions are highly innovative, which makes industries, labor, capital and other factors diffuse and transfer from high-gradient areas to low-gradient areas over time, and this gradient transfer process is mainly expanded through a multi-level urban system.

Gradient transfer theory, emphasizing the priority of efficiency and taking into account the fairness, actually provides corresponding guiding policies for the optimization of industrial structure, transfer and upgrading, and development mode in the region. The theory has achieved good results in practice. In the research of relevant literatures, the great majority of scholars, based on the law of unbalanced development, through the study of the differences in economic development conditions and levels of economic growth, from the perspective of industrial structure adjustment, transfer and upgrading, etc., have analysed industries and factors from high gradient to low gradient transfer, thereby driving the economic development of underdeveloped areas. Under the guidance of this theory, China's reform and opening up took the lead in opening up the coastal areas, and adhered to the development strategy of bringing the rich first, and China’s economy has maintained a sustained high-speed growth for more than 3 decades, forming a miracle in the history of world economic development. Yet, gradient transfer theory also has its very own limitations, mainly due to the fact that it cannot divide the gradient scientifically, and it is easy to widen the development gap between regions in practice. Besides, it ignores the fact that there exist underdeveloped areas in those with high gradients, and relatively developed areas in backward ones. Simply fixing the development positioning of areas with different gradients is likely to lead to further widening of the gap, making developed areas more advanced and backward areas less developed.

Research Methods

Methods

Literature research method

It sorts out and integrates the existing literatures, and qualitatively analyzes the objectively existing regional differences and the situation of regional coordinated development in Guangdong Province on this basis, laying a theoretical foundation for the thesis.

Comparative analysis method

By comparative analysis method, this paper conducted a comprehensive comparative analysis on the unbalanced economic development of 21 cities in Guangdong Province, based on the statistics of Guangdong Province Statistical Yearbook, and from the perspectives of GDP, GDP per capita, disposable income of urban residents per capita, disposable income of rural residents per capita, etc.

Dynamic and static analysis method

First, analyzing the gaps in GDP, industrial structure development and urbanization levels between cities in Guangdong Province from the perspective of static analysis. Second, introducing time variables and using the weighted coefficient of variation, GDP growth rate, GDP per capita growth rate and other indicators to analyze Guangdong Province in terms of spatial difference of the level of coordinated development of regional economy and the evolution trend in the time dynamics.

Data sources

The original data comes from the China Statistical Yearbook (2001-2021), Guangdong Provincial Statistical Yearbook (2001-2021), and Guangdong Provincial Statistical Yearbook (2001-2021) for 21 prefectures and cities. Part of the index values were obtained through secondary calculations. For the missing data of very few years, the interpolation method is adopted.

Results and Discussion

Guangdong Province's total GDP has grown rapidly, leading for 32 consecutive years in China, surpassing more than 90% of countries such as Russia, South Korea, Australia, and Spain. Yet, the gap among eastern, western and northern wings of Guangdong and the Pearl River Delta region has always been huge and hard to cover. Especially compared with the three other major economic provinces of Zhejiang, Jiangsu, and Shandong in China, the gap between the rich and the poor in Guangdong Province is particularly large.

According to the differences in economic development level, location conditions, and three industrial structures among regions within the province, Guangdong can be divided into 4 regions, namely, the Pearl River Delta, Eastern Region, Western Region and Northern Region (Also known as Mountainous Region), which can be shown in Table 1:

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Table 1 Regional division of Guangdong Province

Region	Municipal city	Number of administrative districts
Pearl River Delta	Guangzhou, Shenzhen, Zhuhai, Zhongshan, Dongguan, Foshan, Jiangmen, Huizhou, Zhaoqing	9
Eastern	Shanwei, Jieyang, Shantou, Chaozhou	4
Western	Zhanjiang, Maoming, Yangjiang	3
Northern	Shaoguan, Meizhou, Qingyuan, Heyuan, Yunfu	5

Static analysis of coordinated development of regional economy in Guangdong Province

Analysis of inter-regional GDP differences and relevant changing trends

The two-level differentiation of economic aggregates between municipal cities in Guangdong Province has further intensified. Guangdong's GDP in 2020 year was 11,076.094 billion Yuan, being the only province in the country which exceeded 11 trillion yuan, and its nominal growth rate was as high as 924.6%. In 2020 year, the GDP of the Pearl River Delta, Eastern Guangdong, Western Guangdong and Northern Guangdong was 8,952.392, 705.351, 773.997, and 644.354 billion Yuan, respectively. GDP of the Pearl River Delta accounted for 80.8% of the province's GDP, and the area of Eastern, Western and northern Guangdong accounted for 70% of the province, GDP only accounted for 19.2% of the province's GDP. Among the 21 cities in Guangdong Province, Qingyuan, Yangjiang, Shaoguan, Meizhou, Shanwei, Heyuan, Chaozhou and Yunfu had a GDP of less than 200 billion yuan, all of which fell on the eastern, western and northern regions of Guangdong. After the long-term GDP of Yunfu City exceeded 100 billion, this was about 28 times different from that of Shenzhen City with the highest economic aggregate. In contrast, Jiangsu Province, of which GDP closely following Guangdong Province, had 4 cities of trillion-dollar value in 2020 year (compared to 3 cities in Guangdong). Suzhou, which has the highest economic aggregate in 2020 year (2,017.05 billion Yuan), was with an only about 6 times gap with the city of Suqian, 326 billion Yuan, of which GDP ranked the lowest in the province. As shown in Figure 1, compared with 2000 year, the gap between the GDP of most cities in eastern Guangdong, western Guangdong, and northern Guangdong in 2020 year and the largest Shenzhen city in 2020 year has been widening, not only in the absolute value of the total economic gap between municipal cities, but the relative gap is also getting bigger and bigger. In 2000 year, the GDP of 8 cities was less than 10% of the first ranking, and as many as 10 cities in 2020 year. In short, the agglomeration capacity of the Pearl River Delta is very strong, the siphon effect is too strong, excellent talents, funds and other elements are concentrated in the Pearl River Delta, and the uneven development of the province's regions is very huge.

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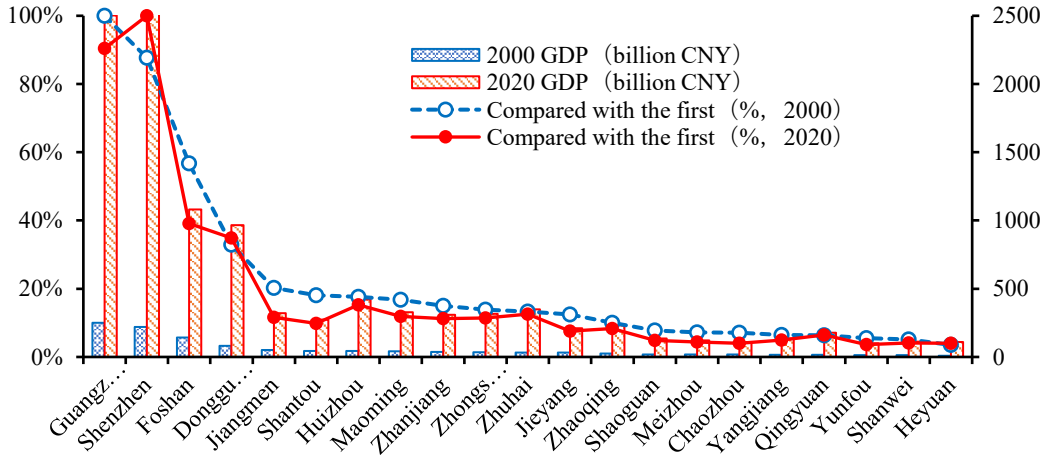

Figure 1 Differences and changes in the total GDP of 21 cities in Guangdong

Analysis of regional differences in per capita GDP and relevant changing trends

The gap of GDP per capita in Guangdong Province is shrinking, yet signs of "polarization" still exist. In 2020 year, Guangdong's per capita GDP is 96,138 Yuan, and the national GDP per capita was 72,371 Yuan, with Guangdong Province ranking the 6th. GDP per capita of the six cities of Chaozhou, Yunfu, Shanwei, Heyuan, Jieyang, and Meizhou was 50% lower than the provincial average, while the five cities of Shenzhen, Zhuhai, Guangzhou, Foshan and Dongguan are higher than the provincial average. Figure 2 shows that, compared with 2000 year, the gap between the GDP per capita of most cities and the province's first place has been shrinking, whereas the gap is still very large, and the problem of uneven regional economic development still exists. In 2020 year, Shenzhen ranks first in GDP per capita, with a GDP per capita of 157,575 Yuan. Zhuhai, Guangzhou, Foshan and Dongguan are those only cities with GDP per capita reaching the first half of Shenzhen, and there are even 9 prefecture-level cities whose GDP per capita is less than 30% of Shenzhen. It can be seen that there are still signs of "polarization" in the distribution of urban economic levels, and the trend is not optimistic.

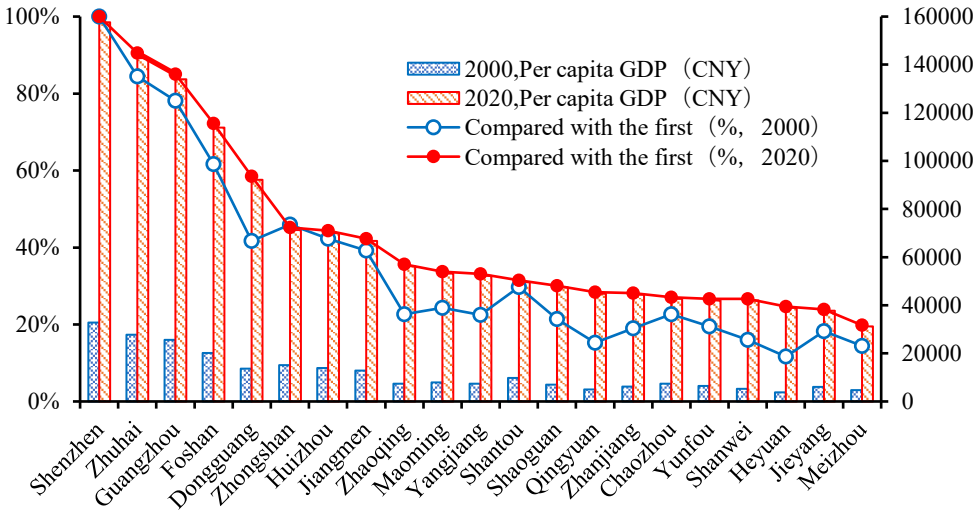

Figure.2 Differences and changes of GDP per capita in 21 cities in Guangdong

Analysis of the difference in residents' income among regions and relevant changing trends

In 2010 year, the disposable income of urban residents per capita in Guangdong Province and the disposable income of rural residents per capita were 412.13 and 193.25 Yuan, respectively, and in 2020 year they were 50,257.0, 20143.4 Yuan. In 2020 year, the disposable income of urban residents per capita in the Pearl River Delta, Eastern Guangdong, Western Guangdong, and Northern Guangdong were 59,225.1, 29,622.2, 31,971.0, 31,095.7 Yuan, and the disposable income of rural residents per capita were 26,856.5, 17,357.1, 19,267.8, and 17,698.0 Yuan, respectively. As shown in Figures 3 and 4, from the perspective of each prefecture-level city, the absolute value of urban residents' per capita disposable income has increased significantly, but the relative value has not declined significantly. Rural residents' per capita disposable income, which has shown large growth rate of absolute value, and the relative value gap has narrowed significantly.

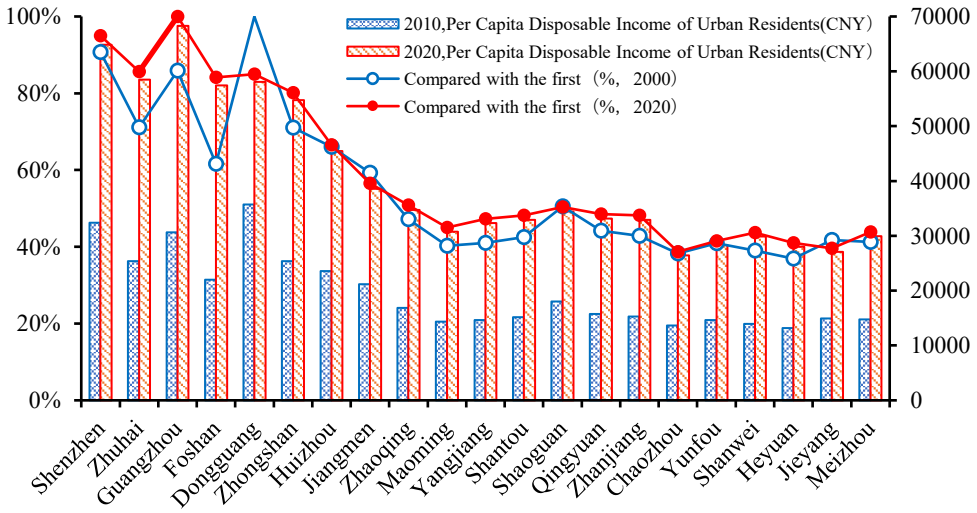

Figure 3 Changes in the differences in the per capita disposable income of urban residents in 21 cities in Guangdong

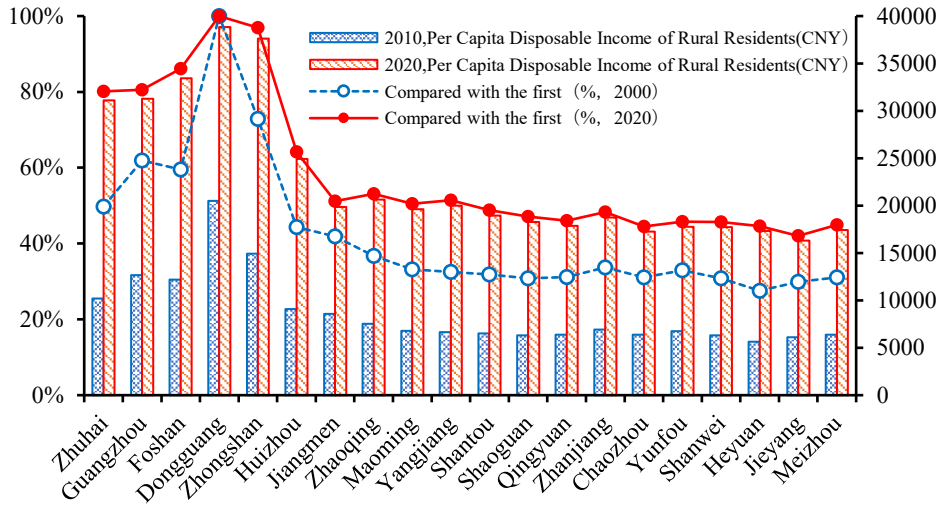

Figure 4 Changes in the differences in the per capita disposable income of rural residents in 20 cities in Guangdong

Dynamic analysis of coordinated development of regional economy in Guangdong Province

Static analysis is mainly a comparative analysis performed at a certain time node and cannot be analysed from a long time span. Therefore, there are certain limitations in measuring development trends. Hence, we introduced time variables to conduct a dynamic analysis of the status quo of the coordinated development of regional economy in Guangdong Province over a long time span.

Analysis of Coefficient of Variation

Analyse the dynamic evolution by calculating the coefficient of variation (CV).

$$\mathrm{CV} = \frac{\sigma_i}{\mu_i} \times 100\% \qquad (1)$$

Among them, σ_i represents the standard deviation of indicators in different regions in the i-th year, and μ_i represents the average value of indicators in different regions in the i-th year.

It can be seen from Figure 5 that the coefficient of variation of GDP among the 21 cities in Guangdong Province fluctuates roughly in the range of 70%-82%. On the whole, the coefficient of variation of GDP has shown a downward trend in fluctuations, indicating that the gap in economic development between cities in the province is gradually narrowing.

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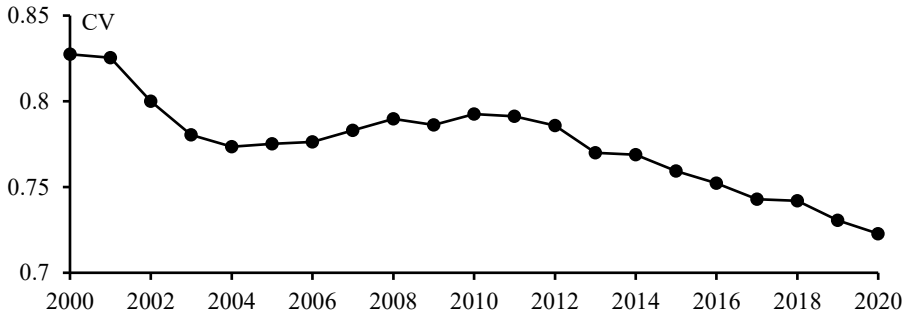

Figure 5 Coefficient of variation trend of GDP from 2000-2020 year

Location analysis

Using 2000 year as the base period and 2020 year as the reporting period, the GDP growth rate and per capita GDP growth rate are used to calculate the economic development center of Guangdong Province. The data collection results are shown in the table 2.

Table 2 The regional orientation of 21 cities in Guangdong province GDP growth

(billion CNY)

Region	2000 Year	2020 Year	GDP Growth Value	Growth multiple
Guangdong	1074.13	11076.09	10001.97	9.31
Guangzhou	249.27	2501.91	2252.64	9.04
Shenzhen	218.75	2767.02	2548.28	11.65
Foshan	141.51	1081.65	940.14	6.64
Dongguang	82.03	965.02	882.99	10.76
Jiangmen	50.47	320.10	269.63	5.34
Shantou	45.02	273.06	228.04	5.07
Huizhou	43.92	422.18	378.26	8.61
Maoming	41.74	327.93	286.20	6.86
Zhanjiang	37.38	310.02	272.64	7.29
Zhongshan	34.54	315.16	280.62	8.12
Zhuhai	33.24	348.19	314.96	9.48
Jieyang	31.11	210.21	179.11	5.76
Zhaoqing	24.98	231.17	206.19	8.25
Shaoguan	19.27	135.35	116.08	6.02
Meizhou	18.05	120.80	102.75	5.69
Chaozhou	17.79	109.70	91.91	5.17
Yangjiang	16.02	136.04	120.02	7.49
Qingyuan	15.79	177.72	161.92	10.25
Yunfou	13.77	100.22	86.45	6.28
Shanwei	12.85	112.38	99.53	7.75
Heyuan	8.77	110.27	101.50	11.57

It can be seen from Table 2 that from 2000 year to 2020 year, all cities in Guangdong Province that are close to or higher than the province's average GDP growth rate are Shenzhen, Dongguan, Zhuhai, Qingyuan, Heyuan, and Guangzhou. The province's average GDP growth Value is 476.284 billion yuan. The cities that are higher than the provincial average are Guangzhou, Shenzhen, Foshan and Dongguan. Therefore, when GDP is used as a measurement indicator, only Shenzhen, Guangzhou, and Dongguan meet the province's economic development centers. Shenzhen's economic foundation and location conditions determine its central position and have an advantage in development speed.

Table 3 The regional orientation of 21 cities in Guangdong province per capita GDP growth

(CNY)

Region	2000 Year	2020 Year	Growth Value	Growth multiple
Guangdong	12735.66	96138	83402	6.55
Guangzhou	25626	134000	108374	4.23
Shenzhen	32800	157600	124800	3.80
Foshan	20231	113900	93669	4.63
Dongguang	13679	92200	78521	5.74
Jiangmen	12851	66700	53849	4.19
Shantou	9741	49600	39859	4.09
Huizhou	13877	69900	56023	4.04
Maoming	7981	53100	45119	5.65
Zhanjiang	6231	44400	38169	6.13
Zhongshan	15077	71300	56223	3.73
Zhuhai	27693	142700	115007	4.15
Jieyang	6001	37700	31699	5.28
Zhaoqing	7422	56200	48778	6.57
Shaoguan	7028	47400	40372	5.74
Meizhou	4728	31200	26472	5.60
Chaozhou	7444	42700	35256	4.74
Yangjiang	7377	52300	44923	6.09
Qingyuan	5003	44800	39797	7.95
Yunfou	6399	42000	35601	5.56
Shanwei	5262	42000	36738	6.98
Heyuan	3826	38900	35074	9.17

Analysis of the regional industrial layout of Guangdong Province

According to Table 3, Zhaoqing, Qingyuan, Shanwei, and Heyuan have higher per capita GDP growth rates than the provincial average, but Shenzhen, Zhuhai, Guangzhou, and Foshan where per capita GDP growth is higher than the provincial average. Although the per capita GDP of Zhaoqing, Qingyuan, Shanwei, and Heyuan has grown rapidly, the economic foundation is relatively weak, and the per capita GDP growth is only 1/2 of the provincial average, which still cannot have a significant impact on the province's economic growth. Therefore, according to the analysis of location orientation, Shenzhen, Zhuhai, Guangzhou, and Foshan

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are still in line with the province's economic development centers.

On the whole, from 2000 year to 2020 year, the cities that constitute the regional economic development center of Guangdong Province are represented by Shenzhen, Guangzhou, Dongguan, Zhuhai, and Foshan in the Pearl River Delta, which is ahead of Eastern Guangdong, Western Guangdong and Northern Guangdong.

Analysis of the regional industrial layout of Guangdong Province

With the rapid economic development of Guangdong Province, the differences between regions are also expanding. The industrial structure of the Pearl River Delta, Eastern Guangdong, Western Guangdong and Northern Guangdong has different priorities in the industrial structure. From the perspective of the industrial structure of various regions in Guangdong Province in 2020 year, the ratio of the first, second, and tertiary industries in the Pearl River Delta, Eastern Guangdong, Western Guangdong, and Northern Guangdong is: 1.6:41:57.4, 8:43:49, 18: 34:48, 15:33:52. It can be seen that in the primary industry, eastern Guangdong, western Guangdong, and northern Guangdong are much higher than the Pearl River Delta. In the secondary industry, the Pearl River Delta and eastern Guangdong are not much different, while western Guangdong and northern Guangdong are basically the same. Among the tertiary industries, the Pearl River Delta is farther away, being higher than that of Eastern Guangdong, Western Guangdong and Northern Guangdong. The above data shows that the Pearl River Delta, relying on its location factors, economic foundation, national policies and other factors, has a large proportion of the tertiary industry, and the modern service industry is relatively complete.

Affected by differences in resource endowments, distinctive economy, comparative advantages, etc., the cooperation benefits of the Pearl River Delta, Eastern Guangdong and Northern Guangdong are not yet obvious, and the industrial chain needs to be restructured, built and integrated. From the perspective of the context of the industrial chain, the mountainous areas of northern Guangdong and the east and west wings provide part of the basic agricultural and sideline industries, raw materials, and primary products. While the Pearl River Delta region provides most of the final consumer products of light and heavy industries. In other words, there is only a fairly loose supply chain of the preceding and following industries in the Pearl River Delta and other regions. We can confirm this from the regional industrial layout of Guangdong Province.

Guang-Fo-Zhao (Guangzhou-Foshan-Zhaoqing) metropolitan area has significant industrial development levels, clear division of labor, and high-end services gathering and sharing. Guangzhou has formed a structure of "service center + large-scale park". The productive service industry is concentrated in the central city, and advanced manufacturing is concentrated in the park. Foshan has formed a structure of "professional town + park", traditional manufacturing has formed many specialized town clusters, and advanced manufacturing Industry is also concentrated in the park. Zhaoqing is dominated by a "park + villages and towns" structure, the manufacturing industry is mainly concentrated in advantageous locations such as high-tech zones, and the peripheral villages and towns are dominated by traditional industries. The industrial development pattern of Shen-Guan-Hui (Shenzhen-Dongguan-Huizhou) metropolitan area shows a significant

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radiating effect of Shenzhen, and the evolution of the internal industrial structure and industrial division of labor has been significantly adjusted. The industrial spatial layout of the metropolitan area has changed from a typical "road economy" to “Shen-Guan-Hui on the track”. Cross-border regional key platforms and leading enterprises have become important nodes supporting the integrated development of regional industrial networks. Zhu-Zhong-Jiang (Zhuhai-Zhongshan-Jiangmen) metropolitan area has shown a trend of evolving from homogeneous competition and decentralization to a characteristic division of labor and service sharing integration. Manufacturing is still the main type of industrial agglomeration, and the industrial spatial layout is relatively obvious characteristics of cluster agglomeration, the trend of industrial spatial agglomeration in cross-border areas is beginning to appear, and the interaction between cities is still insufficient.

Eastern Guangdong has a better economic foundation, with more developed light manufacturing and service industries, and a relatively high degree of export. More industries are concentrated in industries related to residents' daily necessities, such as textiles, clothing, footwear, toys, and furniture. These industries do not have high requirements on the scale, technology, and labor quality of the enterprise, the industry has low barriers to entry, most of the products are of medium grade, the scale of the enterprise is small, and the management is extensive. It will take a certain amount of time to form the advantage of scale.

Featured pillar enterprises in the western Guangdong petrochemical industry have an outstanding role, with large-scale enterprises, well-developed agriculture, abundant agricultural products, and great potential in the marine industry. Although western Guangdong has advantages in scale, it lacks technological advantages. The industrial chain is not long enough. Production is mainly concentrated in certain links of the industrial chain, especially the production of low-end products. The low output of high-value-added downstream products and the few product varieties have affected the petrochemical industry, with a further overall development of industry and agriculture.

The mountainous area of northern Guangdong has abundant labor resources and low prices, which can fill in blank industries and provide favorable conditions for undertaking the transfer of industries in the Pearl River Delta and developing labor-intensive industries. At present, the Pearl River Delta Economic Belt and the Mountain Economic Belt are gradually forming complementary advantages, but there is no major breakthrough in scale and structure.

Analysis of regional logistics transportation network layout in Guangdong Province

As the starting point of the Maritime Silk Road, Guangdong Province is adjacent to Hong Kong, Macau, Hunan, Jiangxi, Guangxi, Fujian and Hainan. It is geographically close to most RCEP members and has a superior geographical location. It is the gateway to the world from the southern coast of China. Therefore, the development of the logistics industry in Guangdong Province plays a particularly prominent role in the development of the regional economy.

The proportion of logistics output value in GDP reflects to a certain extent the level of regional economic development and the degree of regional economic coordination. It can be seen from Figure 6 that from 2008 year to 2020 year, the logistics output value of Guangdong Province will remain above 3% of GDP.

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Even if it is affected by the new coronavirus epidemic, it will still account for 3.03% in 2020 year. The Pearl River Delta and Western Guangdong logistics output will account for the overall proportion of GDP trend declined, but still remained between 4.0% and 5.0%. The northern Guangdong showed an overall upward trend, but due to the impact of the new coronavirus epidemic, it dropped rapidly from 5.5% to 2.5%. In the eastern Guangdong, it was with a fluctuation around 2.0%.

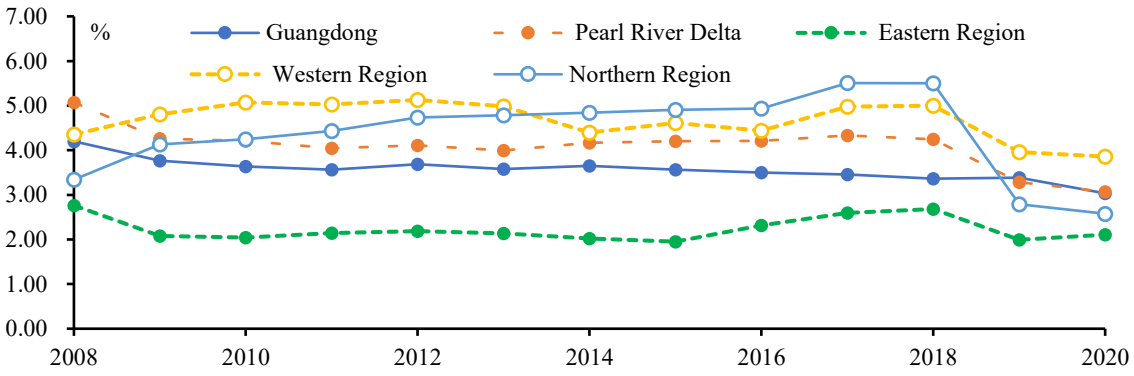

Figure 6 The proportion of logistics output value in each region of Guangdong Province to GDP

The development of the logistics industry in Guangdong Province has benefited from its well-developed logistics transportation network. Guangdong Province has initially formed the main framework of "twelve vertical, eight horizontal, two rings and sixteen shots", supplemented by 70 dense lines and connecting lines, with the Pearl River Delta as the core, and coastal cities, ports, airports and railway hubs as the main support. The Guangdong-Hong Kong-Macao Greater Bay Area develops in-depth cooperation, leads the development of the east and west wings and the coastal economic belt, and quickly connects to the expressway network of surrounding provinces. The main manifestations are as follows: First, the expressway network covering the whole province radiating to the Pan-Pearl River has been initially formed. By the end of 2020 year, the total mileage of expressways opened to traffic will be the first in the country to exceed 10,000 kilometers. The second is the construction of many railway lines including Beijing-Guangzhou railway, Beijing-Kowloon Railway, Ganzhou-Shaoguan Railway, Nanning-Guangzhou Railway, Guiyang-Guangzhou Railway, etc., initially forming a radial road network with the Guangzhou hub as the center, connecting the Pearl River Delta and the east, west, and north of Guangdong, and radiating east, south, central and southwestern China pattern. In 2020 year, the railway operating mileage reached 4,869 kilometers, of which high-speed railways reached 2,065 kilometers, and high-speed railways covered 20 prefecture-level cities in the province. Third, the Guangdong coastal port cluster with the Pearl River Delta as the core has become the logistics center of the Asia-Pacific region. There are five large coastal ports, namely Guangzhou Port, Shenzhen Port, Zhuhai Port, Shantou Port and Zhanjiang Port, and two major inland ports, Foshan Port and Zhaoqing Port. There are 338 berths of 10,000 tons and above. 3000-ton ships can reach Guangxi directly from Guangzhou Port, Shenzhen Port, Zhuhai Gaolan Port, etc., and 1,000-ton ships can reach downtown Shaoguan directly from Sanshui, Foshan. The fourth is to form a "5+4" backbone airport aviation route. Five hub airports in the Pearl River Delta region,

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including Guangzhou Baiyun Airport, Shenzhen Bao'an Airport, Pearl River Delta Shinkansen Airport, Zhuhai Jinwan Airport, and Huizhou Pingtan Airport, will be built in the Pearl River Delta region, and Jieyang Chaoshan Airport, Zhanjiang Airport, Meixian Airport and Shaoguan Airport will be built in eastern Guangdong, western Guangdong and northern Guangdong branch airports.

Although Guangdong Province has initially achieved full coverage of major integrated transportation hubs and key scenic spots, the transportation infrastructure in Eastern, Western and Northern Guangdong is still far from the Pearl River Delta. For example, the coastal areas of eastern and western Guangdong are rich in marine resources, the terrain is flat, and there are many ports. There is a lot of room for development. However, the area density of expressways is generally low, only 58% of the provincial average, less than 1/3 of the Pearl River Delta. Seriously restrict the development of the logistics industry. To achieve a new round of development in eastern Guangdong, western Guangdong and northern Guangdong, it is necessary to make up for the shortcomings of transportation facilities, add more railways and highways, promote a smoother and reasonable flow of production factors, and expand relations with RCEP member countries. The bilateral trade volume further serves the development of Guangdong's regional economy.

Theoretical analysis and discussion

Growth Pole" theory: No impact power in core cities

The growth pole theory emphasizes the importance of building a growth center point, that is, the importance of the growth pole for accelerating regional development. However, from the perspective of regional development in Guangdong Province, the core city growth pole has not been formed.

From the perspective of the province, the influence of core cities has declined. From the above analysis, it can be seen that Guangzhou and Shenzhen are undoubtedly the growth poles of the provinces. Guangzhou and Shenzhen will account for 22.6% and 25.0% of the province's GDP in 2020 year, but the current agglomeration and radiation effects of the two cities are Weaken. The average economic growth rates of Guangzhou and Shenzhen from 2001 to 2005, 2006 to 2010, 2011 to 2015, and 2016 to 2020 were respectively higher than the provincial average of 2.15%, 1.64%, 1.33%, and 0.49%. In the last four "five years", the contribution rate of the two cities of Guangzhou and Shenzhen to the province is gradually weakening.

From a regional perspective, Eastern Guangdong, Western Guangdong, and Northern Guangdong all lack their own economic core. Shantou, Maoming and Shaoguan are traditional economic strong cities in eastern Guangdong, western Guangdong and northern Guangdong respectively. In 2000 year, Shantou City, Maoming City, and Shaoguan City accounted for 42.2%, 43.9%, and 25.5% of the total economic output of each region, respectively, occupying a dominant position in each region. At the same time, the economic structures of these three cities also have structural advantages in the region. The secondary and tertiary industries have a relatively high proportion. The three cities can be described as the core cities in their respective regions, and they should play the role of regional economic growth poles. However, after years of development, Shantou, Maoming, and Shaoguan have not formed growth poles in the region, but have shown

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a multi-polar development trend in the region. As shown in Table 4, in 2020 year, the GDP of the three cities of Shantou, Maoming, and Shaoguan accounted for 38.7%, 42.4%, and 21.1% of each region, respectively, showing a downward trend compared with 2000 year, and their influence on the region will not increase but decrease. Zhanjiang in western Guangdong has a share of 40.1%, which is close to Maoming. While Qingyuan in northern Guangdong overtakes Shaoguan with 27.6%.

Table 4 Regional share of GDP of each city

Eastern Region	Proportion	Western Region	Proportion	Northern Region	Proportion
Chaozhou	15.6%	Zhanjiang	40.1%	Shaoguan	21.0%
Shantou	38.7%	Maoming	42.4%	Meizhou	18.7%
Jieyang	29.8%	Yangjiang	17.6%	Qingyuan	27.6%
Shanwei	15.9%			Heyuan	17.1%
				Yunfou	15.6%

To this end, Guangdong Province shall effectively play the core driving role of the growth pole. On the one hand, from the perspective of the province as a whole, it is highly necessary to make full use of the "Dual-Area-Driven" development policy of the Guangdong-Hong Kong-Macao Greater Bay Area and the pilot demonstration area to further strengthen the growth pole of the Pearl River Delta, so as to give full play to the role of the main position of the Greater Bay Area and the first phalanx of the construction of the first demonstration area, improve the energy level of the central city, and exert the agglomeration and spill-over effects of the central city, thereby activating the economic growth vitality of eastern, western and northern Guangdong. It can contribute to the main function of the regional economic layout with obvious, complementary advantages and high-quality development, realizing the scale economy effect of the urban agglomeration. On the other hand, it is proposed to combine the economic development status of eastern, western and northern Guangdong, build a new development pattern of the "twin cities" economic circle, and optimize the functional layout of which, so as to comprehensively improve the development level and core competitiveness, thereby leading the drive to promote the "twin cities" effect of the city's economic circle. By consolidating the foundation for the development of the twin cities of "Shantou-Chaozhou", "Zhanjiang-Maoming" and "Shaoguan-Qingyuan", strengthening the coordination of planning, policies and projects, and exploring the establishment of high-quality development in the fields of industrial development, public services, ecological and environmental protection, to name but a few, the required benefit-sharing mechanism is likely to radiate and drive the overall development of the region. For example, in the western region of Guangdong, Zhanjiang and Maoming shall be positioned as two central cities in that Zhanjiang gives full play to the advantages of its green steel industry cluster and green paper industry cluster, while Maoming gives full play to the advantages of green petrochemical industry cluster and modern agricultural industry cluster. On this basis, by giving full play to the advantageous industries of both Zhanjiang and Maoming, an industrial linkage development pattern is formed featuring "dislocated competition, point-to-face linkage, and complementary advantages" with a lead of regional economic growth.

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Sustainable development" theory: a long way to go

The theory of sustainable development emphasizes development that can meet the needs of contemporary people without jeopardizing the ability of future generations to meet their needs. In the process of rapid economic development in Guangdong Province, a series of problems have almost inevitably appeared. It is not only manifested in the continuous expansion of the development gap between regions at the spatial level, but also in the unsustainable mode of regional economic development at the time level. First, from the above analysis, it can be seen that the uneven development of the regional economy in Guangdong Province is showing an increasingly serious trend. Second, the continuous improvement of environmental quality in eastern, western and northern Guangdong has become more difficult. The water quality of Lianjiang is still heavily polluted. The task of remediation of heavy metal pollution in areas such as Guiyu in Shantou and Dabaoshan in Shaoguan is still quite heavy. The third is that Eastern Guangdong, Western Guangdong, and Northern Guangdong lack science and technology engines, and technological investment is far behind the Pearl River Delta. In 2020 year, the R&D expenditures of enterprises in the East Wing, West Wing and the mountainous areas of northern Guangdong will account for only 0.9%, 0.4% and 0.7% of GDP respectively, which is far lower than the province's 2.8% level. The total R&D expenditure in eastern Guangdong, western Guangdong and northern Guangdong is only 4.4% of the province's R&D expenditure.

With the iteration of sustainable development theory, development has changed from simple economic growth at first to sustainable development including ecological civilization. Taking advantage of the ecology can not only fully release the ecological effect, but also convert it into economic potential energy. Guangdong Province is building a new regional development pattern of "one core, one belt and one area" (namely, the Pearl River Delta core area, the coastal economic belt, and the northern ecological development area) with a new path of ecological priority and green development. Pearl River Delta core area shall pay more attention to industrial ecologicalization and ecological industrialization. By releasing the structural power of green development, enhancing the supply of high-quality ecological production, and building an institutional system that internalizes environmental costs, it is bound to activate the advantages of green development and increase the upgrading of production, technological transformation, and comprehensive environmental improvement, so as to achieve a win-win situation between environmental friendliness and economic development while the economy maintains its rapid growth and the industry moves to a high-end level. Coastal economic belt needs to continuously upgrade and strengthen its advantageous industries such as green petrochemicals and new energy, and gradually form coastal heavy chemical industrial belts such as petrochemicals and steel, as well as clean energy industrial clusters such as nuclear power and offshore wind power. When undertaking the transfer of industries in the Pearl River Delta, the "Northern Ecological Development Zone" is required to conform to the positioning of regional ecological functions, strengthen ecological construction, pay attention to environmental protection, strengthen pollution prevention & control, thereby strictly prohibiting the transfer of polluting industries and backward production capacity. It is also required to develop a circular economy, promote energy conservation & emission reduction, and promote the economical & intensive utilization of resources, together with improving the carrying capacity of the industry.

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Gradient transfer" theory: latecomer with no advantage

Gradient transfer theory advocates that developed regions should accelerate their development first, and then transfer industries and factors to more developed and underdeveloped regions to drive the development of the entire economy.

According to the theory of gradient transfer, eastern Guangdong, western Guangdong, and northern Guangdong are adjacent to the Pearl River Delta and have obvious "gap". They have the advantage of being a latecomer in the industrial upgrading and structural adjustment of the Pearl River Delta. However, from the perspective of regional economic development in the last 20 years, Eastern Guangdong, Western Guangdong, and Northern Guangdong have not only widened the gap with the Pearl River Delta in terms of economic aggregates, but also the gap with the Pearl River Delta in terms of economic development speed. In 2020 year, there will be a total of 12 cities in eastern Guangdong, western Guangdong, and northern Guangdong. The GDP growth rate of Shanwei, Yangjiang, Yunfu, Qingyuan, and Shaoguan is higher than the provincial average, and the GDP growth rate of the remaining 7 cities is low. In the province's average level, especially Jieyang City's GDP growth rate is only 0.2%, while Heyuan and Chaozhou both have 1.3%, which is far lower than the province's average level of 2.3%. With the integration of regional economy, the economic radiation of the Guangdong-Hong Kong-Macao Greater Bay Area continues to expand. The urban agglomerations of Fujian, Hunan, and Guangxi adjacent to Guangdong have certain advantages in terms of labor, land and other production factors. New competition is formed in the western and northern Guangdong regions. In recent years, the eastern, western and northern Guangdong regions are more like "slope" rather than depressions, and it is difficult to form late-comer advantages.

After a periodical development, Pearl River Delta region is faced with the bottleneck of crowded population, limited land area, and high labor costs. Industrial upgrading and industrial transfer are imperative. The resource endowments of eastern, western and northern Guangdong will make up for the shortage of the Pearl River Delta. In this regard, it is expected to adhere to the principle of "overall planning as a whole ", thereby strengthening the overall top-level guidance of Guangdong provincial government on regional coordinated development, strengthening strategic planning, factor allocation, policy support, etc., with a view to expanding the space for economic development, together with promoting the optimization of the province's economic structure and regional coordinated development. On the basis of fully considering the resource endowments of eastern, western, and northern Guangdong, according to the gradient transfer theory, it is expected to continue to increase resource planning and policy supply, optimize, adjust, transfer and upgrade the industrial structure of the Pearl River Delta. The linkage and synergy of the development of regional sectors will accelerate the eastern, western and northern Guangdong to undertake industrial spillovers from the Pearl River Delta, and enhance the balance and coordination of regional economic development. For example, Guangdong can explore and practice "headquarters + bases", "front-end + back-end", "R&D + manufacturing", "final assembly + supporting" and other co-construction models, so as to strengthen supporting industries in the Pearl River Delta in the fields of, say, autos, steel, and energy.

Conclusion

The regional economic development of Guangdong Province has continued to achieve results, the development level of the Pearl River Delta has accelerated, and the eastern, western and northern Guangdong have shown good signs, however, the economic gap with the Pearl River Delta has been increasing. The unbalanced regional economic development in Guangdong Province has narrowed the economic development space of backward areas and the market is shrinking day off, which has led to the distortion of regional economic relations, affecting the efficiency of economic operation, and in turn dragging down the economic development of the Pearl River Delta.

Weak endogenous development momentum in the east, west and north of Guangdong

Eastern Guangdong, Western Guangdong, and Northern Guangdong all suffer from poor innovation momentum and lack a good platform to attract industries and talents. First, from the perspective of economic growth, in recent years, the education level of the labour force in the Pearl River Delta has been continuously improved, the accumulation of human capital has continued to accelerate, and the improvement of the quality of human capital, technological innovation and technological progress has gradually become the main driving force of economic growth. Yet, eastern Guangdong, western Guangdong, and northern Guangdong are still in the stage of factor scale expansion, the innovation factors of economic development are relatively weak, the development mode is relatively extensive, and the technological innovation ability is not strong. Meanwhile, the quality of employed persons is low and the proportion of employed population with junior high school and below education in the eastern and western wings and the mountainous areas of northern Guangdong is much higher than that in the Pearl River Delta, other than that, the education level of junior high school or higher is much lower than that of the Pearl River Delta. Second, the proportion of R&D investment by industrial enterprises above designated size in eastern Guangdong, western Guangdong, and northern Guangdong in terms of regional GDP is much lower than the average level of the Pearl River Delta. The proportion of R&D institutions set up by industrial enterprises above designated size is relatively low, and most enterprises have not established research institutions. Industrial transformation and upgrading are under great pressure. A considerable number of industries are located in the industrial value chain, and some industries have overcapacity. The proportion of high-tech manufacturing and advanced manufacturing in the added value of industries above designated size is more than 20% lower than that in the Pearl River Delta region.

The actual effect of the industrial transfer policy is not obvious

The industrial transfer in the Pearl River Delta is not strong enough, and the industrial radiation to eastern, western and northern Guangdong is not strong enough. Based on the analysis of the regional industrial layout of Guangdong Province, it can be seen that Guangdong Province has strongly recommended industrial transfer in recent years, but the effect is not good, and the economic backwardness of eastern, western and northern Guangdong has not been fundamentally changed. First, the transfer of competitive high-tech innovation industries in the Pearl River Delta is relatively small, and they cannot bring economic vitality to

eastern, western and northern Guangdong. The purpose of formulating the industrial transfer policy is to eliminate backward production capacity that is insufficient to promote the Pearl River Delta and cause environmental pollution, and ignores whether the backward areas have all-factor support capabilities. Second, the number of leading industries in Eastern Guangdong, Western Guangdong, and Northern Guangdong is relatively small, especially those industries with high technological content that cannot play a leading role. There are 343 large industrial enterprises in Guangdong, most of which are in the Pearl River Delta, and there are only 24 in eastern, western and northern Guangdong. It is difficult to provide a good environment for the coordinated development of the regional economy.

The role of central cities in the east, west and north of Guangdong being not prominent

There are a total of 12 cities in Eastern Guangdong, Western Guangdong, and Northern Guangdong, with small internal differences. The central cities in their respective regions are not prominent, and their contribution to regional growth is limited. Shantou in eastern Guangdong is gradually declining and is chased by Jieyang. Shantou's role as the economic leader of the central city in eastern Guangdong is not obvious. The economic aggregates of Zhanjiang and Maoming in western Guangdong are close to each other. In addition, there is no significant difference between the two cities in major indicators such as industrial added value, fixed asset investment, consumption, fiscal revenue and expenditure, and per capita disposable income of residents. The same problems exist in the five cities in the mountainous area of northern Guangdong. The economic aggregates of Shaoguan and Qingyuan are close, and the gap is small. Shaoguan cannot become the economic leader and assume the status of the central city of northern Guangdong.

Recommendations

The new connotation of regional coordinated development must reflect "innovation, coordination, green, openness, and sharing", and build a new mechanism for regional coordinated development of "effective overall planning, orderly competition, green coordination, sharing and win-win". Imbalance is common, and relative balance should be promoted in development, and "equalization of basic public services, relatively balanced access to infrastructure, and roughly equivalent people's living standards" are the three major goals of regional coordination. Therefore, the development strategy of the Pearl River Delta urban agglomeration needs to pay more attention to the cultivation and formation of development momentum, and the mountainous area of northern Guangdong places more emphasis on ecological protection to form a new source of driving force for the high-quality development of Guangdong Province.

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Improve the construction of systems and mechanisms, and implement the regional development strategy of "One Nuclear, One Belt, and One District"

It is suggested to give full play to the diffusion effect of the regional economic growth pole and weaken the polarization effect of the growth pole, accelerate the exploration and establishment of a new mechanism for the integration of regional markets with unified planning systems, co-promotion of development models, consistent governance, and regional market linkages, and build a multi-form. The wide-ranging and in-depth cooperation mechanism system of “one core, one belt and one area” is to work hard to break down administrative division barriers, promote the free flow of urban and rural elements, and maximize the release of peace Strengthen the development momentum of urban centres in eastern Guangdong, western Guangdong and northern Guangdong, and enhance the overall competitiveness of the region. It is suggested to focus on the following ten aspects to carry out system and mechanism innovation: establish a regional strategic coordination mechanism, innovate industrial development mechanisms, improve major infrastructure construction promotion mechanisms, build regional coordination mechanisms, deepen regional interest compensation mechanisms, optimize regional mutual assistance mechanisms, and improve market integration. When the development mechanism is improved, the basic public service equalization mechanism is improved, the regional policy regulation mechanism is innovated, and the regional development guarantee mechanism is strengthened.

Relying on the digital economy and speed economy, take the "acceleration" of the coordinated development of the regional economy

New factors such as the digital economy and speed economy have broken the inherent pattern. In the context of the speed economy and digital economy represented by new infrastructure such as high-speed rail, the Internet, and artificial intelligence, factors such as new technologies, new industries, and new models have begun to surpass the impact of traditional factors such as spatial distance and resource endowment on the coordinated development of regional economies. Driven by the construction of high-speed, highly comfortable transportation facilities such as high-speed rail, high-speed, aviation, and the construction of the Pearl River Golden Waterway, the province's comprehensive three-dimensional transportation network will be continuously improved, and coastal cities and ports will radiate northward, and the coordinated development of coastal economic belts will be promoted. Regions such as the East and West Wings in the catch-up stage, through industrial coordination, shall make full use of domestic and international markets, accelerate the transfer of Pearl River Delta industries to eastern, western and northern Guangdong, expand the scale of transfer, develop characteristic industries, and expand economic development space. The process of industrial transfer is accompanied by industrial upgrading, and the process and quality of industrialization in the underdeveloped areas of Guangdong Province will surely improve significantly.

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Deep integration of "1+20" strategic industrial clusters, opening up and innovation to promote the coordinated development of regional economies

At present, the matter is not whether to open to the outside world, but how to improve the quality of opening up and the internal and external linkages of development. Innovation is the first driving force for development. And it is to focus on innovation and is to focus on development, to seek innovation is to seek the future. Openness and innovation are two important ways for Guangdong Province to achieve coordinated regional development. As a gathering area of domestic strategic emerging industries, Guangdong Province has gathered a large number of enterprises with advanced manufacturing and strategic emerging industries as the core. Guangdong Pilot Free Trade Zone, consisting of the three major areas of Guangzhou Nansha, Shenzhen Qianhai, and Zhuhai Hengqin, "benchmarks Europe and the United States", shall deeply integrate 10 key pillar industry clusters, such as the new generation of electronic information and 10 strategic areas, serving as semiconductors and integrated circuits. New type of industrial clusters, breaking regional administrative divisions, shall make every effort to build world advanced industrial clusters with international competitiveness. It is expected to build an innovative service system with resource sharing, service coordination, and complete functions, and build a high-level and open economic system to provide new impetus for the development of RCEP regional economic integration.

Using urban agglomerations and metropolitan areas as platforms to create a new engine for high-quality regional economic development

With the advancement of new urbanization, the population and economic factors in the development of Guangdong Province are increasingly concentrated in urban agglomerations. Metropolitan areas with a population of more than 20 million, such as Guangzhou-Foshan-Zhaoqing, Shenzhen-Dongguan-Huizhou have promoted the rapid economic development of the surrounding regions. Central cities drive metropolitan areas, metropolitan areas drive urban agglomerations, and urban agglomerations drive regional development. It is bound to be the mainstream trend of urban development in the future. Through the platform of urban agglomerations and metropolitan areas, we shall strengthen the coupling and interaction between the Pearl River Delta and Eastern Guangdong, Western Guangdong, and Northern Guangdong, promote “quality improvement” with “expansion”, create a large platform for population agglomeration and industrial upgrading, and cultivate new growth poles. The first is to avoid collapse between metropolitan areas, break the administrative boundaries between metropolitan areas, promote the integrated development of cross-city and cross-county junction areas, further enhance comprehensive carrying capacity, accelerate industry and population agglomeration, and improve factor concentration, technological innovation, and culture Leading and comprehensive service functions, promoting industrial transformation and upgrading, and supporting the overall development of the region. Second, it is expected to give play to the functions of small towns in eastern, western and northern Guangdong and the location advantages of connecting large and medium-sized cities to create a batch of distinctive industrial towns and commerce towns and tourist towns, encourage industrial and

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commercial enterprises in large and medium cities to develop in small towns. The third is to strengthen the connection of transportation channels and promote the integration of basic public services, focusing on opening up "broken roads".

Building, supplementing, strengthening, and extending chains, the chain length system empowers high-end industrial clusters

Based on "enlarging", "improving quality" and "increasing efficiency", we shall realize the high-end industrial clustering, promote the integration of industrial chain, supply chain and value chain in the RCEP region, promote the free flow of economic factors in the region, and strengthen cooperation in the division of production among members. It is suggested to promote the expansion and upgrading of the consumer market in the region, and promote the further development of the industrial chain and supply chain in the region. In response to the scattered industrial distribution, short industrial chain, and imperfect industrial chain links in Guangdong Province, various measures have been taken to integrate and utilize external superior resources, and actively build a "chain length + chain owner" work promotion system for the chain length system. Among them, the government level serves as the "chain leader", coordinating the overall work of the construction of key industrial chains. The enterprise level serves as the "chain master", coordinating the implementation of major plans and projects, comprehensively improving the level of industrial development and modernization, and promoting the high-quality leapfrogging of the regional economy in Guangdong Province develop. "Building a chain", researching and combing the development status of the industrial chain by chain lengths, studying and formulating industrial chain diagrams, technical route application field diagrams, and regional distribution diagrams, and grasping the external dependence status of key enterprises in the industrial chain and various links of the industrial chain. "Replenishing the chain", and to accurately assist the coordinated development of the industrial chain, coordinate and solve major difficulties in development, coordinate and promote the development of industrial chain enterprises, investment promotion, project construction, talent introduction and other major issues. "Strong chain", guide enterprises to increase R&D investment, independent or independent jointly establish technical centres, design centres and other institutions. We shall promote the construction of major innovation platforms, build innovation complexes and other public service platforms, and make breakthroughs in a number of key core technologies in the industrial chain. "Extend the chain", carry out industrial chain investment, and lead industrial extension with technological innovation. Establish supporting industries with chain owners as the core, leading enterprises to drive the overall development of the industry, extend the industrial chain up and down, increase the added value of products, and extend the value chain of the enterprise.

Improve the quality and efficiency of the logistics system and accelerate regional economic integration

Under the opportunity of economic globalization and the adjustment of the international industrial

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structure, it will deeply integrate into the global supply chain, improve the quality and efficiency of the regional logistics system, and promote the coordinated development of the regional economy. It is suggested to strengthen the construction of infrastructure such as rural road networks in eastern, western and northern Guangdong, cold chain infrastructure, logistics information sharing platform, cold storage, and smart warehouse. Promote the integrated development of the logistics industry and the regional primary, secondary, and tertiary industries, improve the level of integration, intelligence, and informatization, and build a smart logistics service network. We shall accelerate business linkage, make full use of local population and production scale, stimulate market demand, promote resource, information, and data sharing between logistics enterprises and other industrial enterprises, radiate and gather surrounding market demand, and give play to the core driving role of regional logistics.

Research Prospects

A data model is established, in this paper, to conduct an empirical analysis on the new mechanism of supply chain and sustainable development in Guangdong Province, which mainly uses the statistical yearbook data for analysis of the change trajectory and trend of economic indicators in terms of the quality of economic operation, and the coordinated development of regional economy related to Guangdong regional economy. The index quantification not only examines the changes of the total index and the overall level of the total scale, but also analyzes the changes in the industrial structure of the regional economy and the layout of the logistics and transportation network, based on which the growth pole theory is used, together with sustainable development theory and gradient transfer theory of regional economic development to further analyze the differential performance of the coordinated development of regional economy in Guangdong Province under the framework of RCEP. Finally, six countermeasures and suggestions have been put forward to promote the coordinated development of regional economy in Guangdong Province, with a view to strengthening the interconnection of regional industrial chains and building a new development pattern of domestic and international "dual circulation" mutual promotion.

The coordinated development of regional economy is a complex social and economic system, which involves multiple fields, multiple levels and multiple indicators, including social economy, resource elements, technological innovation, industrial layout, ecological environment, opening to the outside world, and regional planning. Therefore, this paper still needs to conduct in-depth research from the following three aspects: First, it is necessary to further use big data technology, making full use of the statistical yearbook data to extract the most common regional factor indicators to optimize the data model, as well as making the established regional coordinated development model more complete and scientific. Second, it is necessary to combine both of the Guangdong-Hong Kong-Macao Greater Bay Area and the Belt & Road Initiative to further explore the internal and external factors in the coordinated development of the region, aiming to strengthen the cross-regional governance of Guangdong Province, in terms of planning mechanism, market mechanism, cooperation mechanism, support mechanism, and mutual assistance mechanism, with urban-urban linkage, urban-rural integration, international regional competition and cooperation and other research efforts. Third, it is necessary

to further expand the breadth and depth of research, efficient and coordinated development with countries along the Belt & Road initiative, to form coastal and inland interconnection, and to promote the formation of Xiongan New Area in the north helping the coordinated development of Beijing, Tianjin and Hebei; the Yangtze River Delta in the middle leading the Yangtze River Economic Belt; the Guangdong-Hong Kong-Macao Greater Bay Area in the south driving the new pattern of regional economic growth in the Pan-Pearl River Delta.

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