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Regional Disparity and Convergence in China: explore Core-Periphery Dynamics and Industrial Policies

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Abstract

In the backdrop of a global economic slowdown and heightened geopolitical tensions, China's role in shaping the global economic landscape as the second-largest economy cannot be overstated. However, the persistent challenge of regional development inequality within China remains significant despite its economic progress. This paper investigates the reason why and how the China's regional disparity formed based on Krugman's core-periphery model and analyze the influence of economic policies on regional convergence. The application of the core-periphery model has theoretical guiding significance for the development of China's regional economy, to explain China's economic differences from a spatial perspective. Through comparative analysis, it identifies the core and peripheral regions and proves that China's economic differences are impacted by industrial agglomeration, economies of scale, transportation costs, and factor mobility. However, China's economic policies evolve over time, it has an important impact on the disparity and integration of regional economies. The latest major national strategies express China's determination for coordinated regional development. Furthermore, case studies of competitive peripheries find that the dynamic shift from periphery to core. These findings agree with previous scholars' analysis of the causes of regional differences and opinions on how to improve regional competitiveness. However, these studies are mostly concentrated in developed countries in Europe and the United States, and lack the analysis and discussion of the core-periphery theory in the Chinese case. In summary, this study is a supplement to the theme on regional differences and integration in China, consolidating key insights on regional differentiation and convergence in China, emphasizing the pivotal roles of core-periphery dynamics and industrial policy in shaping regional economic trajectories.

Keywords: regional disparity, core-periphery dynamics, peripheral competition, economic policies, China's economic development

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1. Introduction

In the vast expanse of China's economic landscape, the story of development is one of contrasts and complexities. Since the reform and opening up in the 1970s, China's economy has made remarkable achievements. As the nation emerged from the shadows of isolation to become a global economic powerhouse, which is the world's second largest economy, its journey towards prosperity has been marked by remarkable achievements alongside persistent challenges. Central to this narrative is the issue of regional development – a tale of disparity and convergence that reflects the intricacies of China's socio-economic fabric.

At the heart of China's regional development discourse lies the dichotomy between affluence and adversity, as certain regions bask in the glow of rapid growth while others grapple with the shadows of underdevelopment. This phenomenon of regional disparity, rooted in historical legacies, geographic disparities, and policy priorities, has emerged as a defining feature of China's economic landscape. As the report of the 19th National Congress of the Communist Party of China pointed out that socialism with Chinese characteristics has entered a new era, and the principal contradiction facing Chinese society is between the people's ever-growing needs for a better life and the unbalanced inadequate development. Among the many problems of unbalanced and inadequate development, regional economic disparities stand out as a particularly crucial dimension. From the bustling metropolises of the East Coast to the rural hinterlands of the West, the uneven distribution of wealth and opportunities has underscored the urgency of addressing regional imbalances.

Economists have long tried to explain regional economic differences. New economic geography emphasizes trying to provide some explanation for the formation of diverse forms of economic agglomeration (or concentration) in geographical space. Agglomerations or clusters of economic activity occur at different geographical levels and take many different forms. Krugman (1991a) proposed the core-periphery model

in his paper “Increasing Returns and Economic Geography” published in 1991, representing the fundamental introductory framework of New Economic Geography. This framework elucidates how the interaction between increasing returns at the firm level, transportation costs, and factor mobility leads to the emergence or changes in spatial economic structure. Chinese economic geography fits gratifyingly well into the New Economic Geography framework as a dramatic core–periphery pattern has emerged as Krugman pointed out. However, so far, based on the new economic geography theory, the empirical research on regional disparity in China is not consummate. Most of them focus on a specific aspect and lack overallity. In this article, we will use the new economic geography theory based on Krugman’s core-periphery model to explore regional differences in China and conduct a comparative analysis of China’s core and peripheral areas based on the three parameters: transportation cost, economies of scale and factor mobility. It also discusses the formation and changes of spatial economic structure. Additionally, we will analyze the new energy automobile industry cluster in Chongqing and the biomedical industry cluster in Wuhan based on three factors affecting regional competitiveness proposed by Giulio B. and Giancarlo C. in “Competitive Peripheries”: global connectivity, collaboration between the education system and production system, and entrepreneurship and finance.

From temporal dimension, different economic policies implemented by the Chinese government at different times have affected the regional economic pattern to a certain extent. Besides of the disparities that define China’s regional landscape, there exists a narrative of convergence – a narrative shaped by the nation’s relentless pursuit of balanced development and inclusive growth. Recognizing the imperative of spreading the fruits of economic progress to all corners of the nation, Chinese policymakers have embarked on ambitious initiatives aimed at narrowing the gap between the prosperous core and the marginalized periphery. Through targeted investment, infrastructure projects, and regional development strategies, China seeks to foster a more equitable distribution of resources and opportunities, thereby catalyzing the

convergence of its diverse regional economies.

The significance of regional development in China extends far beyond the realms of economics, resonating deeply with issues of social equity, political stability, and global competitiveness. As the world's second-largest economy and a major player in the global arena, China's trajectory of regional development carries profound implications for domestic cohesion and international relations. Moreover, in an era defined by interconnectedness and interdependence, the success of China's regional development endeavors has implications that transcend national borders, shaping the contours of global economic dynamics and geopolitical landscapes.

In this essay, we embark on a journey through the intricacies of China's regional development story, navigating the terrain of disparity and convergence to unravel the factors driving regional imbalances and the strategies employed to foster inclusive growth. By delving into the significance of regional development in China, we seek to illuminate the complexities of the nation's economic trajectory and the opportunities and challenges that lie ahead in its quest for balanced and sustainable development.

The rest of the paper is organized as follows. In Section 2, the general regional disparity in China from spatial and temporal dimensions is described. In Section 3, We will review the development of new economic geography and explain key concepts on core-periphery models. In Section 4, we will analyze the application of new economic geography theory in analyzing regional differences in China. In section 5, we will talk about the competitive peripheral regions in China introduced with some related empirical cases. In section 6, we discuss the industrial policies and effects on regional convergence. Finally, we discuss the challenges and future direction and then conclude.

2. Regional disparity in China

In view of the weak global economy and ongoing regional conflicts, economic recovery and coordinated regional development are current issues that China must solve. The disparities in economic performance across regions not only result from China's rapid economic development but also serve as significant drivers of it. Urbanization and economic agglomeration have fueled industrial growth but also widened income gaps between coastal and interior provinces, as well as between rural and urban areas within provinces. Despite some convergence in recent years, substantial gaps persist. For instance, Shanghai's per capita GDP is nearly five times higher than Gansu's, the poorest province, and rural incomes are on average 60 percent lower than urban incomes, with greater disparities in poorer regions. Additionally, disparities extend to well-being indicators, such as life expectancy and educational opportunities. While lagging regions saw faster catch-up growth in the past, current convergence faces challenges like diminishing returns on investment and mounting debt. As China transitions to a more innovation-driven economy, leveraging developed metropolitan areas along the east coast will be crucial. However, sustaining convergence remains a policy challenge, necessitating strategies to promote growth in leading regions while addressing inequality in lagging ones.

2.1 Geography of disparity

With China's opening up, China's rapid economic growth over the past four decades widened economic disparities among regions especially during the first three decades. Due to favorable initial conditions and market-oriented reforms, growth in coastal areas outpaced the rest of the country. In 1980, special economic zones were set up in Shenzhen, Zhuhai, Shantou, Guangdong, and Xiamen, Fujian, which promoted rapid industrialization and productivity improvements. The coastal region attracted the majority of foreign direct investment and government capital investment between 1999 and 2005, solidifying its position as China's main economic hub. Since 2006,

from the outline of the Eleventh Five-Year Plan for National Economic and Social Development to the Fourteenth Five-Year Plan, outlining the division of China's territory into four major economic blocs, proposals have been put forward to promote the development of the western region, rejuvenate old industrial bases in the northeast, facilitate the rise of the central region, and encourage the eastern region to take the lead in development. How are these four major economic blocs developing today? We will compare and analyze the disparities among the four major economic blocs based on the following four aspects[1]:

Population: The eastern region is densely populated, while the northeastern region has a smaller population.

At the end of 2022, the total population of mainland China was 1,411.75 million, a decrease of 850,000 from the end of the previous year. The population in the eastern region is concentrated, with a total population of 565.69 million, accounting for 40% of the country's total. The central region and the western region are similar, with populations of 364.56 million and 383.06 million respectively, accounting for 26% and 27% of the national total. The Northeast has a smaller population of 96.44 million, accounting for 7% of the country's total. The population size of the eastern region is 5.86 times that of the northeastern region.

[1] The specific divisions of the eastern, central, western and northeastern regions involved in the statistics are as follows: the 10 eastern provinces (cities) include Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan; the 6 central provinces include Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan; 12 western provinces (autonomous regions and municipalities) including Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang; 3 northeastern provinces including Liaoning and Jilin and Heilongjiang.

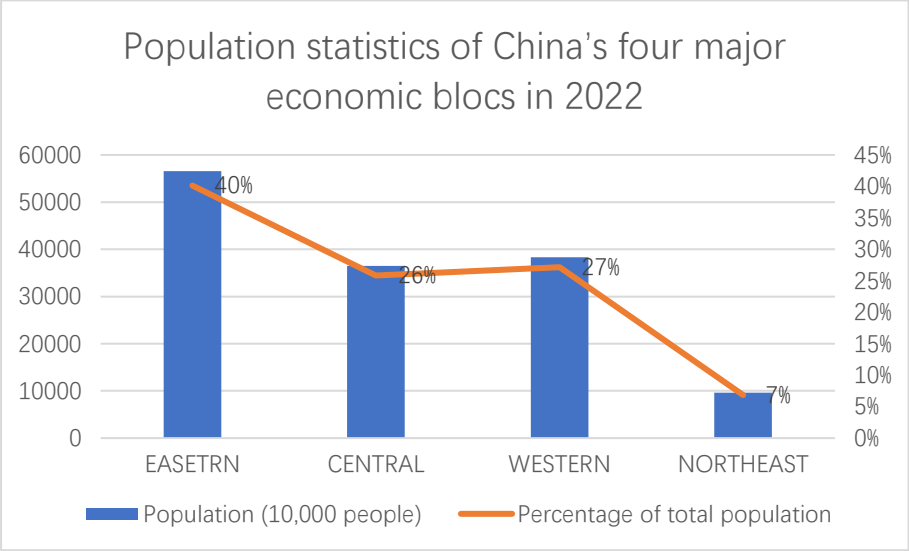

Figure 1: Population statistics of China's four major economic blocs in 2022[2]

GDP: The eastern region contributes half of the country's GDP

The total national GDP in 2022 will be 121.02072 billion yuan, an increase of 5.8% over the previous year. The eastern region contributes half of the country's GDP, with a total GDP of 62.20183 billion yuan, accounting for 52% of the country's total. The total GDP of the central and western regions exceeds 25 trillion yuan, and the total GDP of the central region is 952.7 billion yuan more than that of the western region. The total GDP of Northeast China is relatively small, only 5,794.63 billion yuan, accounting for 5% of the national total. The total GDP of the eastern region is 10.73 times that of the northeastern region.

[2] All the data in the second section is sourced from the "China Statistical Yearbook"

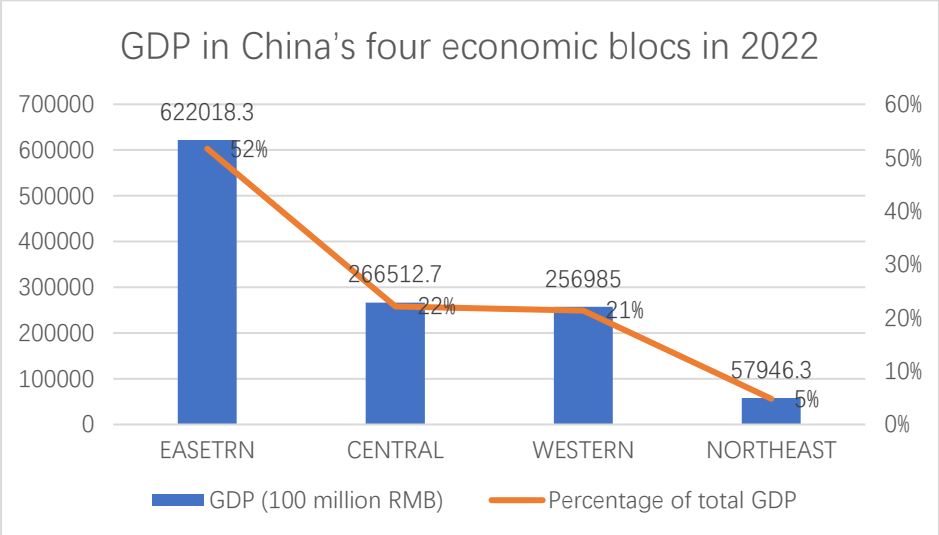

Figure 2: GDP in China's four major economic blocs in 2022

In terms of industrial structure, the proportion of the tertiary industry in the GDP of the four major economic blocs is close to or exceeding 50%, with the eastern region accounting for the highest 56.14% and the central region accounting for the lowest only 49.2%. The primary industry in the Northeast and Western regions accounts for more than 10% of GDP, 13.6% and 11.42% respectively. The primary industry in the eastern region accounts for the lowest proportion of GDP, only 4.55%. The proportion of the secondary industry in GDP in the central region is as high as 42.28%, and in the northeastern region the lowest is only 36.3%.

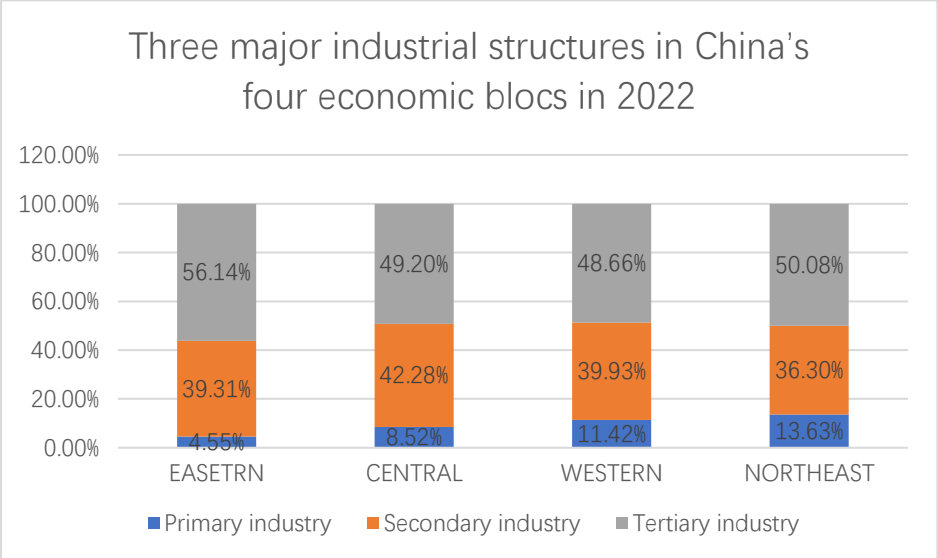

Figure 3: Three major industrial structures in China's four major economic blocs in 2022

Social consumption: The eastern region has strong consumption power

In 2022, the total retail sales of consumer goods nationwide are 53,964.56 billion yuan, a decrease of 0.25% from the previous year. The eastern region accounts for half of the country, with a total retail sales of consumer goods of 22.21855 billion yuan. The total retail sales of consumer goods in the central and western regions accounted for 24.46% and 20.78% of the national total. The Northeast region has at least 1,854.4 billion yuan, accounting for less than 5%. The total retail sales of consumer goods in the eastern region are 11.98 times that of the northeastern region.

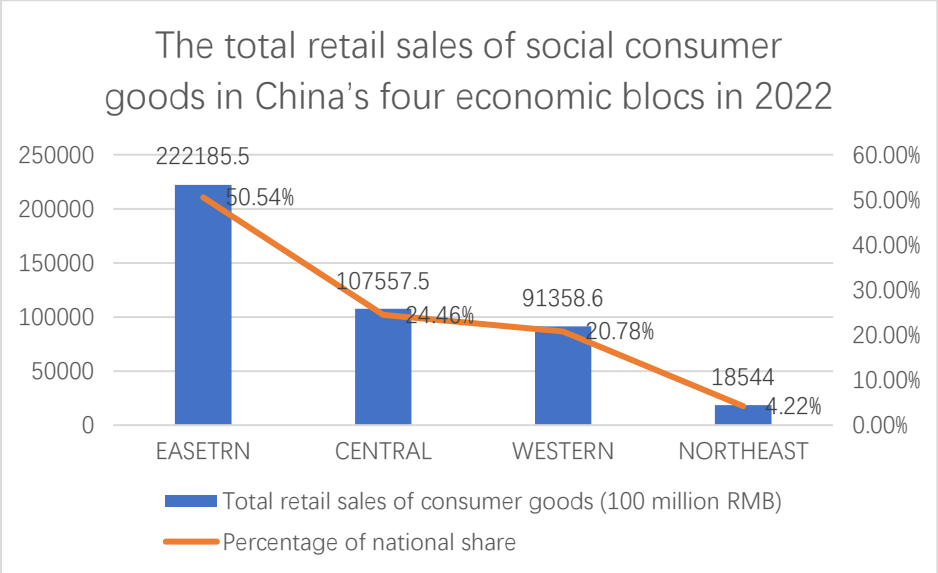

Figure 4: The total retail sales of social consumer goods in China's four major economic blocs in 2022

Import and export: The eastern region has a huge scale of import and export of goods

In 2022, the total import and export of goods nationwide was 41.80116 billion yuan, an increase of 6.9% over the previous year. Among them, exports were 23,741.15 billion yuan, an increase of 9.26%; imports were 18,060 billion yuan, an increase of 4%. The import and export surplus of goods was 5,681.14 billion yuan, an increase of 1,315.83 billion yuan over the previous year. The eastern region has a huge scale of import and export of goods, accounting for 78.97% of the country's total, with a total

import and export volume of 33,010.8 billion yuan. The total import and export of goods in the central and western regions were 3,761.89 billion yuan and 3,817.29 billion yuan respectively. The total import and export of goods in the northeastern region was as low as 1,211.18 billion yuan, accounting for 2.9% of the national share.

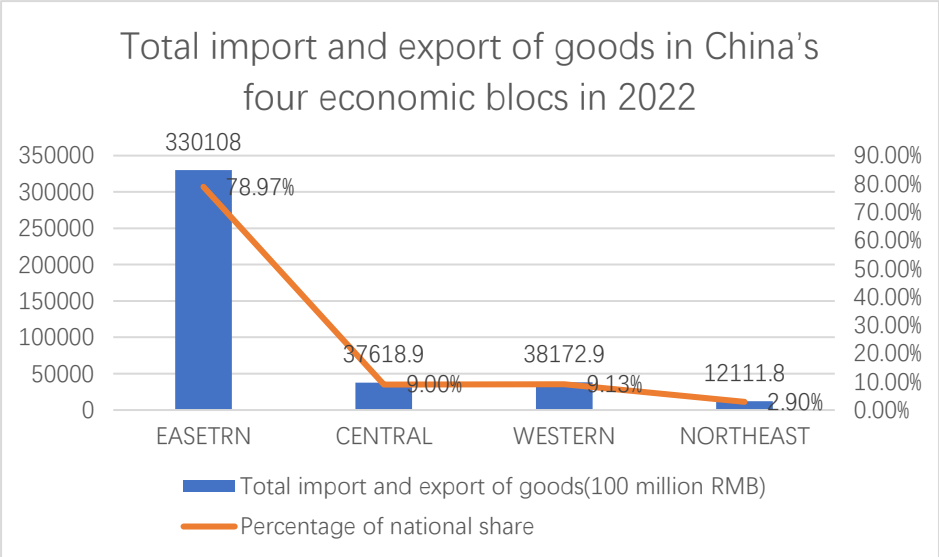

Figure 5: Total import and export of goods in China's four major economic blocs in 2022

From the above, we can see that the eastern region of China remains the main economic center, accounting for only two-fifths of the country's population but contributing to over half of China's GDP. Its industrial structure is more mature, with the strongest consumer purchasing power. Additionally, its imports and exports amount to nearly 80% of China's total.

In terms of spatial differences, there are also economic differences between urban and rural areas. The urban-rural disparity mainly manifests itself in six aspects: the income gap between urban and rural residents, the urban-rural education gap, the urban-rural medical gap, the urban-rural consumption gap, the employment gap, and the government public investment gap. From the perspective of income level, the disposable income of urban residents in 2022 will be 49,282.9 yuan, and the disposable income of rural residents will be 20,132.8 yuan, less than half of the disposable income of urban residents. In terms of education, high-quality educational resources are concentrated in urban areas, while rural education is relatively weak, especially in the central and western regions, same as the medical resources. Besides,

Rural consumption levels are lower than urban consumption levels. Worth to mention that, with the process of urbanization, urban employment opportunities have increased, attracting a large number of famous migrant workers to work in cities. Secondly, with the advancement of agricultural modernization, farmers are more likely to find job opportunities at their doorsteps. The rural employment situation has improved.

2.2 Temporal dynamics of regional disparities

The Gini coefficient, a measure of economic disparity, reveals significant trends in China's inter-provincial and inter-regional economic gaps over time. Dividing the country into provinces(cities) and four major regions and using the GDP at 1978 prices as the indicator, applying the Gini coefficient method, and spanning the period from 1952 to 2021, this study obtained the measurement results of regional economic disparity Gini coefficients in China.

From 1952 to 1960, the inter-provincial Gini coefficient rapidly expanded, peaking in 1960 at 0.275, before decreasing until 1967 to a low of 0.196. Subsequent years saw fluctuation and expansion until 2004, reaching a peak of 0.307, followed by a gradual decline to 0.231 by 2021. Excluding the years 1959 to 1961, the inter-provincial disparity generally remained between 0.20 and 0.25 until 1983, expanded until 2004, and then gradually decreased.

Similarly, the Gini coefficient for economic disparity among the four major regions experienced rapid expansion from 1952 to 1960, peaking at 0.008 in 1960. It then decreased until 1962 to a low of 0.004, remained stable until 1986, expanded to 0.131 by 2004, and gradually decreased to 0.083 by 2021. Excluding the years 1959 to 1961, the disparity generally fluctuated between 0.04 and 0.07 until 1986, expanded until 2004, and then gradually decreased. Overall, both inter-provincial and inter-regional economic disparities in China went through phases of fluctuation, expansion, and reduction over the years.

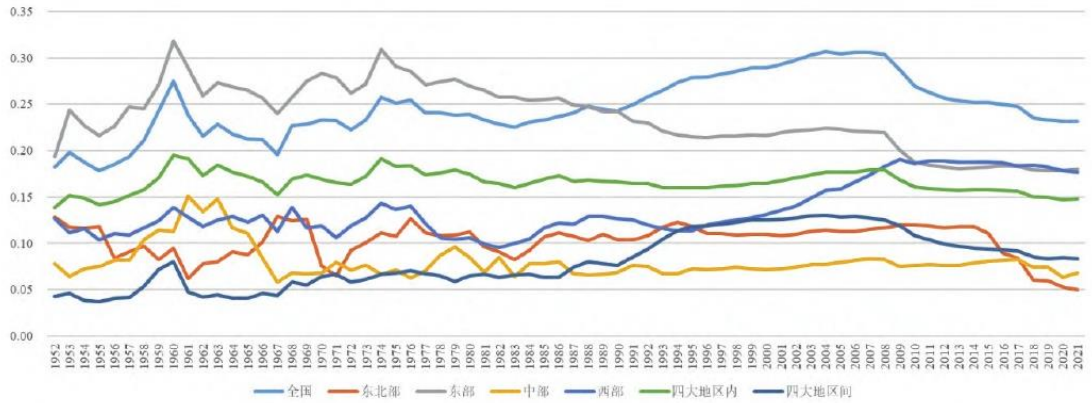

Figure 6: The Gini coefficient of national inter-provincial economic disparity and its decomposition trend in its four major regions from 1952 to 2021[34]

According to analysis by the World Bank, there are two main reasons for this reversal of trends:

1) Growing public debt and difficulty in distributing funds to lagging provinces to support their development;

2) There is a need for the central government to refocus its growth strategy on major metropolitan areas that support the country's transition to an economy increasingly reliant on services, technology and innovation.

Income trends in both rural and urban areas have shown a pattern of gradual convergence. Initially, urban areas within provinces experienced significantly faster income growth compared to rural areas, driven by the concentration of high-productivity industries and valuable service sectors in urban and peri-urban zones. However, this trend began to shift in 2012, attributed to heightened investment, increased productivity, and the expansion of non-agricultural employment opportunities in rural regions.

[3] The evolution of regional economic disparities in China

[4] Light blue line: National; Red line: Northeast; Grey line: Eastern; Yellow line: Central; Blue line: Western; Green line: Inside four regions; Dark blue line: Between four regions

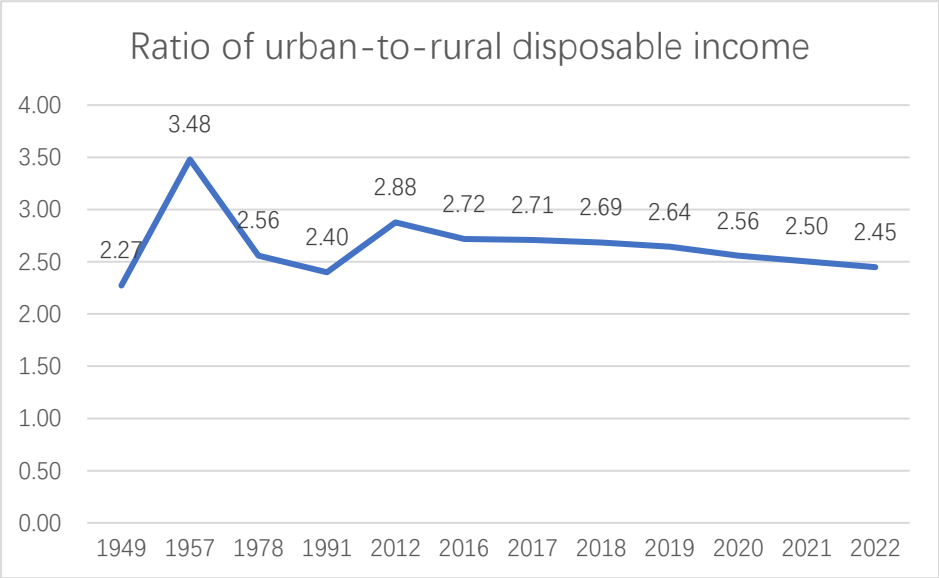

Figure 7: Ratio of urban-to-rural disposable income

3. Krugman’s Core-periphery model

3.1 New economic geography

The evolution of spatial economics, focusing on the geographic distribution of production, has traversed a nuanced historical trajectory. Von Thunen published his most significant work, “The Isolated State” in 1826, laid the groundwork for modern spatial economics. He developed a theoretical model to explain how different types of agricultural activities are distributed across a landscape based on transportation costs and land rent, revolving around several key principles: Isolated State, Land Use Zones, Transportation Costs, Land Rent, which predicted a series of concentric rings of land use around the central market.

Marshall (1890) was the first economist to pay attention to and systematically study the phenomenon of industrial agglomeration. In his book “Principles of Economics”, he explained that specific areas of industrial agglomeration become “industrial areas”, and a large number of interrelated small and medium-sized enterprises are gathering in “industrial areas”. And the two important concepts of “internal economies of scale” and “external economies of scale” are introduced. The influence of “external economies of scale” is the fundamental reason why these interconnected enterprises can gather in industrial zones. External economies of scale mainly include three aspects. First, due to geographical proximity, transportation costs, transaction costs and operating costs are reduced. Secondly, specialized inputs can be more easily obtained through the economies of scale of industrial agglomeration. Third, industrial zones can integrate with local production systems to promote regional economic development.

German economist Webber (1909) first proposed the “industrial location theory” in his book “On Industrial Location”. Industrial location theory is the theory of spatial location selection of industrial enterprises, which forms agglomeration in order to minimize production costs. He believes that the formation of industrial location is

mainly affected by three factors: freight location factor, wage location factor, and agglomeration location factor. Taking enterprises as the research object, he proposed from a micro perspective that the formation of industrial agglomeration generally goes through two stages. In the first stage, the development of the enterprise itself has a certain scale, and the agglomeration effect guides the choice of enterprise location and the tendency of enterprises to agglomerate with each other at this stage; in the second stage, through mutual information exchange and resource sharing between enterprises, industrial agglomeration is finally formed. However, in Weber's theory, his industrial location theory is an abstract, static location theory of isolated factors.

Starting from the publication of "The Spatial Order of Economics" by the German economist Losch (1940), it developed into the multi-factor dynamic location theory. He used realistic factors to analyze and correct the conclusions obtained under hypothetical conditions, proposed a dynamic model, and replaced Weber's free competition with monopolistic competition, replaced the minimum cost with maximum profit, and pursued profit maximization by reducing production costs and transportation costs. It triggers industrial agglomeration and spatial location selection. However, the multi-factor dynamic location theory proposed by Liao Shi is based on the premise of constant returns to scale, and therefore cannot provide guidance on the actual market laws of perfect competition and increasing returns.

Another representative of dynamic location theory, Hoover (1948), published the book "The Location of Economic Activities" and believed that the industrial agglomeration effect is an important explanatory variable affecting industrial location. He pointed out that there is an optimal scale for industrial agglomeration, if fewer companies gather in a certain location, they cannot produce the best effects brought about by agglomeration; conversely, if too many companies gather in a certain location, the agglomeration effect will also decrease.

At the same time, based on Marshall's theory of external scale economies of industrial agglomeration, he further divided two different externalities. One is called "localized economy". This externality is caused by the agglomeration of enterprises in the

industry to organize production. The second is that the formation of externalities called "urbanization economy" is related to the level of economic development of a specific region.

Isard's Regional Science is a multidisciplinary field of study that emerged in the mid-20th century, pioneered by Walter Isard. His seminal work, "Methods of Regional Analysis," published in 1960, provided a rigorous framework for analyzing the spatial dimensions of economic and social phenomena at the regional level.

Henderson's urban systems theory, as outlined in his influential work "The Geography of Urbanization," published in 1974, provides a framework for understanding the spatial organization and evolution of cities within a broader urban system.

Before 1990, the study of economic geography-of the location of factors of production in space-occupied a relatively small part of standard economic analysis. Notably, models derived from Von Thunen found application in urban studies, while Hotelling-type models gained traction in industrial organization, yet the field's overall influence on economic theory remained modest.

However, we often wonder: why people tend to live concentratedly in a certain area, while other areas are more dispersed, or why some developed areas tend to have concentrated populations and developed industries, while other areas are relatively backward. There is no doubt that the facts of economic geography are some of the most salient features of real economies.

In 1991, a seminal breakthrough occurred with Krugman's simple yet transformative model, heralding the inception of the 'new economic geography'. This model, while building upon older frameworks, introduced distinctive features that marked a departure from traditional analyses. Its emergence stimulated a resurgence of theorizing and empirical inquiry within spatial economics, granting the field newfound position.

New economic geography (NEG) originated from classical location theory, and in his article "Economic Geography and Increasing Returns to Scale," Krugman developed the center-periphery model based on the assumptions of imperfect competition,

increasing returns to scale, and "iceberg" transportation costs, thus creating the theoretical development of new economic geography. Subsequently, scholars developed a variety of NEG models based on the CP model, such as the free capital model, the free entrepreneur model, etc. After more than 30 years of unremitting efforts, new economic geography scholars have successfully made agglomeration economics one of the core areas of economic research, confirming the conclusion that industrial agglomeration has a positive impact on regional economic development, and gaining widespread recognition in the academic community.

3.2 Why industry gather

The core-periphery model, as presented by Krugman (1991a), stands as a foundational framework in New Economic Geography (NEG), illustrating how interactions among increasing returns at the firm level, transport costs, and factor mobility shape spatial economic structure. This model, resembling the 2×2×2 structure found in trade theory textbooks, features two regions, two production sectors (agriculture and manufacturing), and two types of labor (farmers and workers). Manufacturing, benefiting from scale economies, produces various differentiated products, while agriculture yields a homogeneous good. Workers enjoy mobility between regions, whereas farmers remain immobile, evenly distributed between the two areas. Transport costs for manufactured goods are accounted for, introducing a positive cost of trade.

The model portrays farmers' immobility as a centrifugal force, contrasting with the more intricate centripetal force driven by circular causation. Greater firm concentration in a region leads to the production of a wider array of products, granting workers better access and higher real incomes. This attracts additional workers, fostering a larger market, known as the home market effect (HME). The incentive to concentrate production in one region, driven by scale economies and offset by transport costs, results in even more varieties available in that concentrated area.

However, if the centripetal forces, propelled by forward and backward linkages,

overpower the centrifugal force of immobile farmers, a core-periphery pattern emerges, with manufacturing concentrated in one region. This pattern is more likely under conditions of low transport costs, highly differentiated products, or significant expenditure on manufactures. Although agglomeration is not guaranteed, minor shifts in critical parameters can trigger tipping points, causing regions to diverge, with one evolving into an industrial core and the other into a deindustrialized periphery. In summary, according to Krugman’s core-periphery model, we can conclude that the emergence of a core-periphery pattern depends on transportation costs, economies of scale, and the share of manufacturing in national income.

3.3 How industry gather

The base for regional convergence is the concept of external economies illustrated by Marshall in explaining localization with three main reasons. Firstly, industrial agglomeration provides a shared labor market, reducing unemployment and labor shortages. Secondly, localized industries can facilitate the production of specialized inputs that aren’t easily tradable. Thirdly, clustered firms benefit from informational spillovers, enhancing their production efficiency compared to isolated producers.

Krugman’s reinterpretation of the phenomenon of industrial localization is based on the external economics of the supply side, which mainly includes the use of basic factors, intermediate inputs and technology. Theoretically, these external economies lead to the phenomenon of industrial agglomeration, thus forming the spatial economic structure of core areas and peripheral areas:

First, the basic factors mainly describe the “reservoir” effect of the labor market. The agglomeration of multiple companies in the same industry in the same area will create a “reservoir” effect in the labor market, attracting more and more skilled workers, thus reducing the risk of unemployment and labor shortages. Take the agglomeration of the automobile industry in Detroit as an example. As the center of the automobile industry, Detroit has attracted a large number of skilled workers and related industry suppliers,

forming a huge labor market and supply chain system. This agglomeration makes it easier for auto manufacturing companies to find workers with specialized skills and gain the advantages of economies of scale. The role of economies of scale. As the scale of the labor market expands, the increasing returns effect in the labor market gradually emerges, attracting more skilled workers to join.

Second, the intermediate input effect. The long-term agglomeration of industries in a certain place will attract a large number of intermediate input suppliers, making it gradually become a regional production center; due to the effects of economies of scale and scope, as the scale of such production centers becomes larger and larger, it will attract more qualified suppliers. Efficient suppliers form a complete industrial chain and production network. Taking China's Pearl River Delta region as an example, the agglomeration of the electronics industry has attracted a large number of electronic component suppliers and supporting service providers, making the region the core area of the global electronics industry. This agglomeration effect allows companies to share the supply chain of intermediate inputs, improving production efficiency and competitiveness. Economies of scale and industrial agglomeration promote the formation and development of production centers, thereby further strengthening interaction and collaboration among enterprises within the region. As an important center of the world's fashion industry, Milan is home to many fashion designers, fabric suppliers and manufacturers. This agglomeration effect has attracted more and more fashion brands and related industry chain companies to settle in, forming a complete fashion industry ecosystem.

Third, the "spillover" effect of technology, that is, it is easier to flow and obtain information about new technologies, new products and new processes within a certain region than other regions, making it easier for companies concentrated in this region to obtain positive external effects. Certain regions have more convenient access to new technologies and knowledge, thus attracting a large number of technology companies and innovative talents. Take Silicon Valley in the United States as an example. Silicon Valley is famous for its open innovation atmosphere and highly

dense group of technology companies. In this region, technical exchanges and cooperation between innovative enterprises are very frequent, and information on new technologies and new products can be quickly disseminated and shared, accelerating the speed and efficiency of innovation.

3.3.1 Effect of economies of scale

Economies of scale are divided into internal economies of scale and external economies of scale. Internal economies of scale are the phenomenon in which a single enterprise reduces its average cost by expanding its production scale; external economies of scale refer to the clustering of multiple enterprises in the same area, reducing costs by sharing infrastructure, labor markets and supply chains.

The formation of economies of scale begins with market size. When the market scale expands, companies can sell more products and share fixed costs; large cities and economic core areas attract more companies and labor force due to their large market size. Reduced transportation costs and improved transportation infrastructure can also promote economies of scale. The agglomeration of enterprises and institutions promotes the spillover of knowledge and technology. Through cooperation in research and development, innovation costs are reduced and the conversion rate of innovation results is improved. In addition, the agglomeration of enterprises in a region can achieve close cooperation and specialized division of labor between the upstream and downstream of the industrial chain and improve production efficiency.

Model economy promotes the competitiveness and production efficiency of enterprises in the region and drives the rapid growth of the regional economy. Of course, the impact of economies of scale cannot be ignored. The existence of economies of scale causes economic activities to be concentrated in a few core areas, while peripheral areas may lag behind due to the lack of economies of scale. Economies of scale attract labor to migrate to core economic areas, resulting in urbanization and population agglomeration.

3.3.2 Industrial chain

The industrial chain refers to the chain-like relationship formed objectively between various industrial departments based on certain technical and economic connections and spatial-temporal layout relationships. It can usually be examined from four dimensions: value chain, enterprise chain, supply and demand chain, and space chain. The industrial chain covers the entire process of product production or service provision, including power supply, raw material production, technology research and development, intermediate product manufacturing, terminal product manufacturing, and even circulation and consumption. It is the unity of industrial organization, production process, and value realization.

The idea of industrial chain originated from British classical economist Adam Smith's discussion of division of labor. Early Western economists believed that industrial chains were mainly activities within manufacturing enterprises. With the expansion of capitalist production, Alfred Marshall (1962), a representative of the neoclassical school of economics, expanded the division of labor between enterprises. It emphasizes the important role of division of labor among enterprises, which should be the real source of modern industrial chain theory.

The industrial chain plays an important role in the development of regional economy. A complete industrial chain can drive production activities in all links and increase economic output value and employment opportunities in the region; by forming industrial clusters, it could promote cooperation and competition among enterprises and improve the overall industry level and innovation capabilities; by rationally arranging all links in the industrial chain, it can balance the development of different industries in the region and achieve coordinated and balanced development; cross-regional cooperation and interaction in the industrial chain can enhance economic ties between regions, to achieve complementary advantages and achieve common development.

Through these effects, the industrial chain not only improves the output value and efficiency of the regional economy, but also promotes industrial upgrading and technological innovation, optimizes resource allocation, enhances regional

competitiveness and synergy, it has played an important role in promoting the sustainable development of regional economy.

3.3.3 Spillover effect

Spillover effect means that when an organization carries out an activity, it will not only produce the expected effect of the activity, but also have an impact on people or society outside the organization. In short, an activity must have external benefits that are not available to the main body of the activity. Spillover effects are divided into knowledge spillover effects, technology spillover effects and economic spillover effects.

Kenneth J. Arrow was the first to use externalities to explain the role of spillover effects on economic growth. He believes that new investments have a spillover effect. Not only can the investing manufacturers improve their productivity by accumulating production experience, but other manufacturers can also improve their productivity through learning. Paul Romer proposed the knowledge spillover model. What makes knowledge different from ordinary commodities is that knowledge has a spillover effect. This enables the knowledge produced by any manufacturer to improve the productivity of the entire society. Endogenous technological progress is the driving force for economic growth.

Knowledge management theory divides knowledge into two categories: explicit knowledge and tacit knowledge. Technical knowledge is mostly explicit knowledge. On the one hand, it is related to professional knowledge, and on the other hand, it is closely related to the accumulation of experience. Therefore, knowledge spillover is limited in spatial scope. It also explains the formation and development of enterprise clusters and their innovation advantages from one perspective.

3.3.4 Labor agglomeration

From the perspective of NEG, labor agglomeration is an important concept, which explains why and how labor is concentrated in certain areas, thus affecting regional

economic development. Economies of scale are the core driving force for labor aggregation. The cost advantages and production efficiency improvements brought by large-scale production attract companies to concentrate in certain areas, thereby driving the aggregation of labor. In large cities or economic core areas, the market potential is greater, and it is easier for companies to obtain customer and market information, which further attracts labor to concentrate in these areas. The spillover effect of knowledge and skills brought about by labor aggregation promotes innovation and improvement of production efficiency. High-density human resource networks and frequent knowledge exchanges are typical features of labor aggregation.

3.4 Core-Periphery Multiplier Effect

The concept of multiplier effect in regional economy is to demonstrate, organize and lead the surrounding areas through industrial connections and regional connections. The core-periphery multiplier effect explains how initial development in a core region triggers a chain reaction of positive economic impacts that spread throughout the surrounding periphery areas:

Initial Development and New Investment: This refers to the establishment of new industries, businesses, or infrastructure projects in the core region. It could involve government initiatives, private sector investments, or a combination of both aimed at stimulating economic growth.

Increase in Employment and Population: The growth of industries in the core region creates job opportunities, attracting workers from peripheral areas seeking employment. This influx of migrants contributes to population growth in the core region.

Higher Population and Increased Demand: With more people residing in the core region, there is a corresponding increase in demand for goods and services. This heightened demand stimulates business activity and encourages further investment in the region.

Further Investment and Business Expansion: The increased demand prompts businesses to expand their operations to meet consumer needs. Additionally, entrepreneurs may be incentivized to start new ventures in the core region, leading to the diversification and expansion of the local economy.

Economic Improvement: As businesses expand and new ventures emerge, the overall economic conditions in the core region improve. This may manifest in higher GDP growth rates, increased productivity, and a reduction in unemployment rates.

General Increase in Wealth: The economic improvements benefit not only businesses but also individuals residing in the core region. Higher wages, improved job opportunities, and a thriving economy contribute to an overall increase in wealth and living standards for the population.

Infrastructure and Service Development: To accommodate the growing population and economic activity, there is a need for enhanced infrastructure and services. This may include the construction of new roads, public transportation systems, healthcare facilities, schools, and other amenities.

Further Development of the Core: The improvements in infrastructure and services attract more businesses, investors, and residents to the core region. This perpetuates the cycle of growth, reinforcing the core-periphery divide as the core region continues to experience robust development compared to peripheral areas.

By concentrating economic activity, infrastructure and human capital in core urban centers, the multiplier effect helps to promote the development of core areas. This can create jobs, improve living standards and increase access to goods and services in the region. At the same time, a multiplier effect often accompanies urbanization as people migrate from rural areas to cities in search of better employment prospects and living conditions. This demographic change drives population growth in and around core urban centers, shaping the spatial distribution of economic activity.

Although the multiplier effect can bring economic prosperity to core areas, it may also exacerbate spatial inequality between core and peripheral areas. Surrounding areas may have limited access to economic opportunities, infrastructure, and public services,

resulting in disparities in income, employment, and living standards.

3.5 Core-Periphery relationships

Core areas usually have a higher level of economic development, with developed industries and advanced technology, while peripheral areas are relatively backward. Unbalanced development is the main differentiating feature between core and peripheral areas. This difference may lead to core areas performing better in terms of economic growth, employment opportunities, and per capita income, while peripheral areas face the challenges of lagging development and economic backwardness.

However, there are also strong connections between the core and the periphery. The core-periphery model emphasizes the economic linkages and interactions between regions. Core areas are often the engines of economic development and have high productivity, technological level and market size, thus attracting a large amount of resources and factors to gather there. Peripheral areas may be subject to the influence of core areas, and phenomena such as resource outflow and brain drain are more common. It is not difficult to find that the flow of factors between regions has an important impact on the relationship between core and peripheral regions. The flow of human capital, technology, capital and other factors can promote economic coordination and resource allocation between regions, but it may also exacerbate regional gaps and imbalances.

After understanding the differences and connections between core and peripheral areas, the government can adopt corresponding policy orientations and regional policies to adjust the problem of uneven regional development. Core areas may receive key support and preferential policies from the government to promote their economic development and industrial upgrading; while peripheral areas may need government policy support and resource allocation to narrow the development gap with the core areas.

The core-periphery model is an important theoretical framework in new economic

geography, used to explain the imbalance and differentiation of economic development among regions. In this model, core regions represent regions with relatively strong economic development, while peripheral regions represent regions with relatively weak economic development. The core-periphery model explores factors such as inter-regional economic connections, industrial agglomeration, economies of scale, transportation costs, and factor mobility, as well as the impact of their interactions on regional economic structure and development patterns.

The content of this chapter revolves around the core-periphery model. It first introduces the basic concepts and theoretical principles of new economic geography, including the characteristics of core and peripheral regions, industrial agglomeration and economies of scale, industrial chains and spillover effects, etc. Finally, the importance of the core-periphery model in regional economic research and policy formulation is summarized, and the necessity of strengthening inter-regional cooperation and coordination and optimizing regional development strategies is emphasized.

In summary, this chapter provides an in-depth discussion of the theoretical connotation of the core-periphery model, provides an important reference for understanding the imbalance and differentiation of regional economic development, and is of great significance for formulating regional development policies and promoting economic growth.

4. Application of core-periphery model in China's regional disparity

4.1 Identify core and peripheral areas

The public is relatively clear about China's core and periphery. Since core regions are usually areas with developed economies, concentrated industries, strong innovation capabilities, complete infrastructure, and significant radiation and driving effects on surrounding areas; while peripheral regions are areas with relatively low economic development levels, single industrial structures, weak innovation capabilities, and relatively backward infrastructure, the coastal areas are usually considered as the core regions, instead the inland areas are the periphery areas. However, we still need to use quantitative indicators to confirm and analyze.

To identify which provinces and cities in China belong to the core area or the peripheral area, we can mainly refer to economic indicators, social development indicators, infrastructure indicators and innovation capacity indicators.

First, let's look at economic indicators. We will consider Gross Domestic Product (GDP) and per capita GDP, which can reflect the total economic volume of the region and the living standards of residents. In terms of industrial structure, we will use the proportion of the tertiary industry for analysis, because the higher the proportion of the tertiary industry (service industry) and high-tech industries, the higher the degree of modernization of the economic structure. Last but not least, in terms of fiscal revenue, the higher the local fiscal revenue, the better the public services and infrastructure construction can be supported.

After sorting, the specific data of each province and city are as follows:

Province/City	Total GDP (billion yuan) (2022)	GDP per capita (yuan) (2022)	the tertiary industry % (GDP = 100) (2022)
Beijing	41610.9	190313	83.9
Tianjin	16311.3	119235	61.3
Hebei	42370.4	56995	49.4
Shanxi	25642.6	73675	40.8
Inner Mongolia	23158.6	96474	40

Liaoning	28975.1	68775	50.5
Jilin	13070.2	55347	51.7
Heilongjiang	15901.0	51096	48.1
Shanghai	44652.8	179907	74.1
Jiangsu	122875.6	144390	50.5
Zhejiang	77715.4	118496	54.3
Anhui	45045.0	73603	50.9
Fujian	53109.9	126829	47
Jiangxi	32074.7	70923	47.6
Shandong	87435.1	86003	52.8
Henan	61345.1	62106	49
Hubei	53734.9	92059	51.2
Hunan	48670.4	73598	51.1
Guangdong	129118.6	101905	54.9
Guangxi	26300.9	52164	49.8
Hainan	6818.2	66602	60
Chongqing	29129.0	90663	52.9
Sichuan	56749.8	67777	52.2
Guizhou	20164.6	52321	50.5
Yunnan	28954.2	61716	50
Xizang	2132.6	58438	53.8
Shaanxi	32772.7	82864	43.5
Gansu	11201.6	44968	51.3
Qinghai	3610.1	60724	45.5
Ningxia	5069.6	69781	43.7
Xinjiang	17741.3	68552	44.9

Table 1: Economic indicators

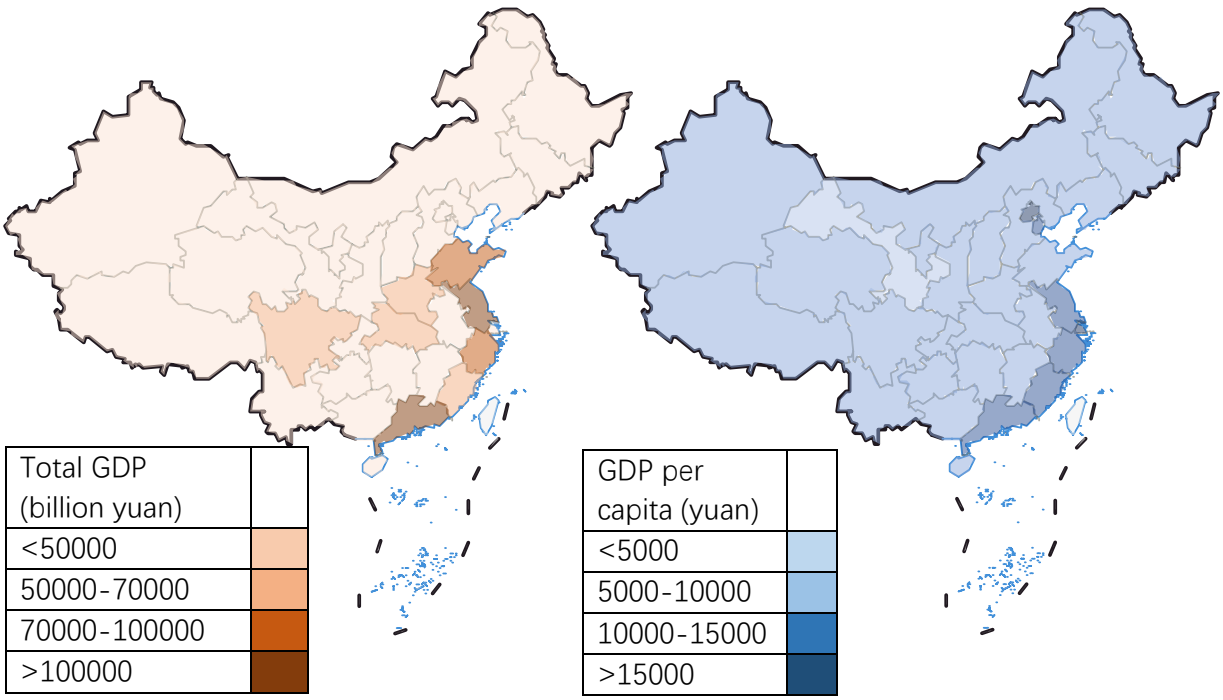

Figure 8: Colored map of total GDP (left)

Figure 9: Colored map of GDP per capita (right)

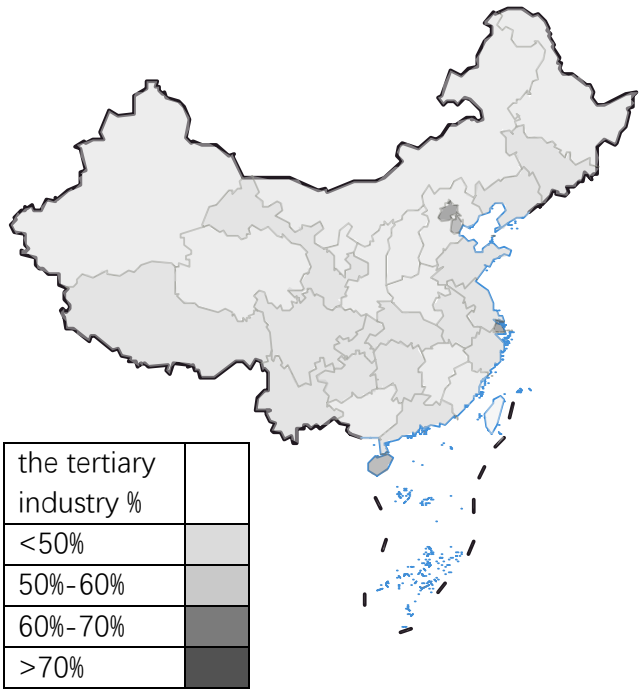

Figure 10: Colored map of the tertiary industry %

According to the colored map above which is transferred from the data in the table 1, we can find that the total GDP and per capita GDP are obviously higher in coastal areas and lower inland areas. Although inland provinces such as Sichuan and Henan have high GDP, population accounts for an important factor, because Sichuan and Henan are both populous provinces in China.

In terms of industrial structure, the proportion of tertiary industry in the north and northwest regions is lower than that in the south, but there is no obvious difference between the coast and the inland.

In general, in terms of economic indicators, the core regions are mainly Guangdong, Fujian, Zhejiang, Shanghai, Jiangsu, Shandong, Tianjin and Beijing.

Next, let's look at social development indicators, which are mainly per capita disposable income, urbanization rate, and education and medical resources. Generally speaking, per capita disposable income can measure the living standards of people in a region. In other words, the higher the per capita disposable income, the higher the living standards. The urbanization rate is the proportion of urban population to the

total population. A high urbanization rate is usually associated with better infrastructure and services. Education and medical resources refer to the distribution of key universities, scientific research institutions and high-quality medical resources. Generally speaking, core areas usually concentrate more high-quality resources.

By organizing the data, we get the following table:

Province/City	per capita disposable income (yuan) (2022)	urban population % (2022)
Beijing	77414.5	87.57
Tianjin	48976.1	85.11
Hebei	30867.0	61.65
Shanxi	29178.2	63.96
Inner Mongolia	35920.6	68.6
Liaoning	36088.8	73
Jilin	27974.5	63.72
Heilongjiang	28345.5	66.21
Shanghai	79609.8	89.33
Jiangsu	49861.7	74.42
Zhejiang	60302.5	73.38
Anhui	32745.2	60.15
Fujian	43117.7	70.11
Jiangxi	32418.7	62.07
Shandong	37560.1	64.64
Henan	28222.4	57.07
Hubei	32913.6	64.67
Hunan	34036	60.31
Guangdong	47064.6	74.79
Guangxi	27980.7	55.65
Hainan	30956.6	61.49
Chongqing	35665.9	70.96
Sichuan	30679.2	58.35
Guizhou	25508.2	54.81
Yunnan	26936.8	51.72
Xizang	26674.8	37.39
Shaanxi	30115.8	64.02
Gansu	23273.1	54.19
Qinghai	27000	61.43
Ningxia	29599.3	66.34
Xinjiang	27062.7	57.89

Table 2: Development indicators

If we transfer the data on the map, it would be more obvious.

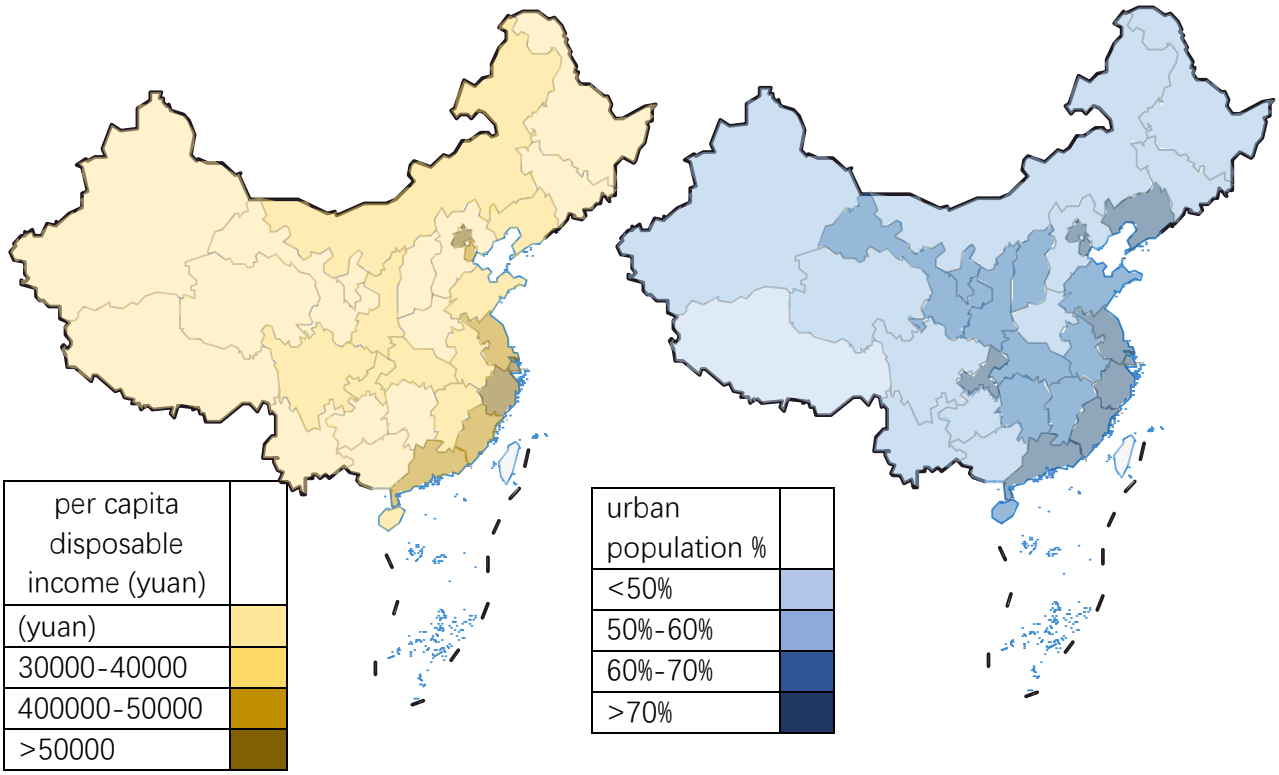

Figure 11: Colored map of per capita disposable income (left)
Figure 12: Colored map of urban population % (right)

Based on the colored map we can see the difference in per capita disposable income between coastal and inland areas. The per capita disposable income of coastal cities and provinces is significantly higher than that of inland cities, followed by some central inland provinces, such as Sichuan, Chongqing, Hubei, etc. The southwest, northwest, and northeast are relatively lower. It shows that the central region has begun to rise in regional development.

The urban population ratio can be used to illustrate the urbanization rate. Coastal provinces and cities are significantly higher than inland areas, and extend to the northwest of the inland.

In addition, in terms of educational resources, we can find that Beijing's performance in higher education supply in 2017 was significantly higher than that of all provinces in China (including Shanghai and Tianjin). In other words, according to ARWU's

BCUR 2019, Beijing has a large number of four-year higher education institutions relative to the province's population, and many of them are also of very high quality. In contrast, CHEI is relatively low in densely populated areas (Guangdong, Henan, Shandong, Sichuan), areas bordering other countries (Guangxi, Yunnan, Xinjiang, Inner Mongolia) and areas with a large population proportion. Ethnic minorities (Qinghai, Guizhou). Some of these provinces may face difficulties in developing a skilled workforce and may also face "brain drain" due to limited educational provision, which in turn may hinder future economic growth and development.

Figure 13: Chinese Higher Education Quality Index (CHEQI): 2017.[5]

In short, in terms of social development indicators, coastal provinces and cities have obvious advantages, followed by inland and central regions. Other regions are relatively lagging behind in social development.

Infrastructure indicators are mainly divided into two parts, one is the transportation

[5] Note: Chinese Higher Education Quality Index (*CHEQI*) based on the overall scores obtained by higher education institutions listed in the 2019 Best Chinese Universities Ranking for the 31 provinces of China.

network and the other is the level of informatization. The eastern coastal area has dense transportation infrastructure such as railways, highways, ports and airports, and the transportation is highly convenient; the central region has developed high-speed railway and highway networks and convenient transportation in major cities, but some rural and remote areas need further improvement; infrastructure construction in the western region is increasing, and high-speed railway and highway networks are gradually improving, but the overall density and quality are relatively low.

Figure 14: Railway map of China

Figure 15: Highway map of China

In terms of informatization, the eastern region has a high Internet penetration rate,

complete information technology infrastructure, and a developed digital economy; the central region has a higher level of informatization, with Internet and broadband penetration rates increasing year by year, and e-government and digital economy developing rapidly; internet penetration and broadband access levels in the western region continue to improve, but there is still a gap between them and the eastern and central regions.

It can be seen that China's infrastructure is the most developed in the eastern coastal areas, followed by the central region, and is lacking in the western and remote areas. However, through the support of national policies, the infrastructure gap between regions is gradually narrowing. The improvement and balanced development of this kind of infrastructure is of great significance to promoting the coordinated development of the national economy and improving overall competitiveness.

Finally, innovation capabilities play a vital role in modern economic and social development. It is not only a core element of enterprise and national competitiveness, but also an important driving force for economic growth and social progress. In this article, we will use the R&D activities (patent applications) of industrial enterprises to measure the differences in each province and city.

We use the data of patent applications in 2022 to organize, as follows:

Province/City	Number of patent applications (pieces) (2022)
Beijing	32594
Tianjin	18488
Hebei	33789
Shanxi	9827
Inner Mongolia	9065
Liaoning	21581
Jilin	12612
Heilongjiang	6551
Shanghai	42835
Jiangsu	218368
Zhejiang	171872
Anhui	81620
Fujian	57792
Jiangxi	32595

Shandong	113621
Henan	47069
Hubei	59771
Hunan	43973
Guangdong	354470
Guangxi	11637
Hainan	1567
Chongqing	26245
Sichuan	41462
Guizhou	9294
Yunnan	11139
Xizang	97
Shaanxi	19071
Gansu	5979
Qinghai	1423
Ningxia	4725
Xinjiang	6164

Table 3: Innovation capabilities

We can reflect the data on the colored map and we will find below:

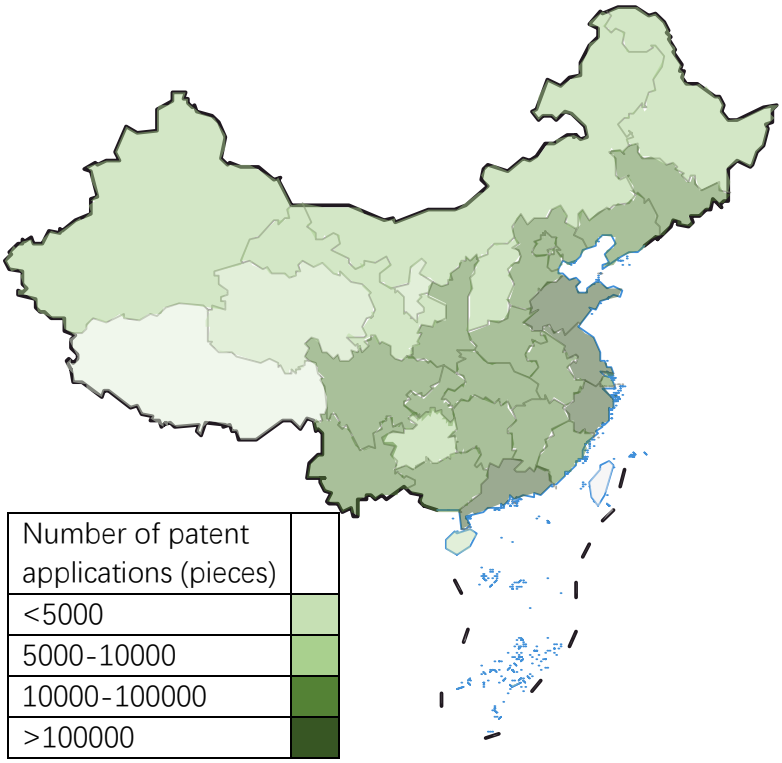

Figure 16: Colored map of patents applications

We found that some provinces and cities on the eastern coast also have an absolute advantage in innovation capabilities, such as Guangdong, Zhejiang, Jiangsu, and Shandong.

In the end, after comprehensive consideration of economic indicators, social development indicators, infrastructure indicators and innovation capability indicators, we can clearly distinguish core and peripheral areas. The core areas are coastal provinces and cities such as Guangdong, Fujian, Zhejiang, Shanghai, Jiangsu, Shandong, Beijing, and Tianjin. We classify other areas as peripheral areas, mainly inland provinces and cities.

4.2 Analysis of industrial agglomeration and economies of scale

Industrial agglomeration refers to a process in which the same industry is highly concentrated in a specific geographical area and industrial capital elements continue to converge within a spatial scope. The study of industrial agglomeration originated at the end of the 19th century. Marshall began to pay attention to the economic phenomenon of industrial agglomeration in 1890 and proposed two important concepts: “internal economy” and “external economy”. After Marshall, industrial agglomeration theory has developed greatly, and many schools have emerged. The more influential ones include: Weber’s location agglomeration theory, Schumpeter’s innovative industry agglomeration theory, E.M. Hoover’s optimal scale theory of industrial agglomeration, Porter’s corporate competitive advantage and diamond model, etc.

China’s coastal areas have abundant resources, superior geographical location and relatively complete infrastructure. These factors have attracted a large number of enterprises and talents to gather here, forming an industrial agglomeration effect. According to the theory of new economic geography, the industrial agglomeration effect can bring about the concentration and exchange of production factors, thereby promoting cooperation and competition among enterprises and improving the innovation ability and competitiveness of the industry. Take the Pearl River Delta region of Guangdong Province as an example. This region has gathered a large

number of manufacturing and high-tech industries, forming one of the largest manufacturing bases in the world. For example, Shenzhen, as a city at the forefront of China’s reform and opening up, has attracted the gathering of many electronic technology companies, such as Huawei and Tencent, forming a cluster of electronic information industries. This industrial agglomeration effect not only promotes technological exchanges and cooperation between enterprises, but also attracts a large number of talents and investments, promoting the rapid development of the regional economy.

In China’s inland areas, due to factors such as remote location and high transportation costs, companies tend to be dispersed, making it relatively difficult to form an effective industrial agglomeration effect. Industrial fragmentation may lead to weakened resource sharing and technological innovation capabilities among enterprises, thereby restricting their development potential. Taking Yunnan Province as an example, due to factors such as remote location and inconvenient transportation, industrial dispersion in this region is relatively common. Although Yunnan Province is rich in resources and ecological environment, due to high transportation costs, companies tend to disperse locally, resulting in insufficient industrial agglomeration effects. For example, Yunnan Province’s agricultural and mineral resources are widely distributed, but due to transportation difficulties, companies often face challenges such as high logistics costs and poor market information, making it difficult to form effective industrial agglomerations.

Economies of scale are when the production scale of an enterprise reaches a certain level, the organic combination of various production factors produces a 1+1>2 effect. China’s coastal areas generally have large market sizes and intensive economic activities, which provide enterprises with opportunities for economies of scale. Economies of scale mean that enterprises achieve economic benefits through scale expansion, increased production efficiency and reduced costs, thereby gaining competitive advantages in the market. The developed transportation and logistics network in coastal areas further promotes the realization of economies of scale. For

example, efficient ports and shipping systems provide enterprises with convenient raw material procurement and product sales channels. As one of China's largest economic centers, Shanghai has a huge consumer market and developed financial, logistics and other infrastructure, attracting many multinational companies to set up headquarters or regional headquarters here. These multinational companies can reduce production costs and improve competitiveness by concentrating production and supply and taking advantage of economies of scale.

The market size in China's inland areas is relatively small, and it is difficult for companies to enjoy the economies of scale comparable to those in coastal areas. At the same time, infrastructure construction in inland areas is relatively lagging behind, such as deficiencies in transportation, energy and communications, which also limits the possibility of enterprise scale expansion and efficiency improvement. For example, Guizhou Province, as a representative of China's western inland region, has actively promoted industrial structural adjustment, transformation and upgrading in recent years. However, due to its small market size, it is difficult for enterprises to achieve scale expansion and efficiency improvement. In addition, the infrastructure construction in Guizhou Province is relatively lagging behind, which also restricts the development of enterprises.

To sum up, there are obvious differences between China's coastal areas and inland areas in terms of industrial agglomeration and economies of scale. It gives us a more intuitive feeling for understanding the differences between China's core and peripheral regions.

4.3 Assessment of transportation costs and factor mobility

Transportation costs and factor flows will be analyzed together because they are often closely related. These two factors are regarded as important factors affecting regional development and industrial agglomeration in new geographical economics, and there is an interaction between them. Transportation costs directly affect the mobility of

factors (such as labor, capital, raw materials, etc.). Lower transportation costs can reduce the transportation costs of goods and factors, making it easier for companies to transport production factors from peripheral areas to core areas, or to purchase production factors in core areas. Conversely, higher transportation costs may impede the free flow of factors, making it more difficult for peripheral regions to obtain factors of production relative to core regions.

Due to the geographical advantages and developed transportation network in core areas, local transportation costs are usually low. For example, coastal areas have well-developed port facilities and road and rail networks, and cargo transportation costs are relatively low. According to data from the National Bureau of Statistics, Guangdong Province's freight volume reached 7.95 billion tons in 2019, accounting for 21.4% of the country's total freight volume, reflecting its developed logistics network and low transportation costs. In inland areas, transportation costs may be higher due to limited transportation conditions, including increased costs caused by factors such as long transportation distances and poor transportation channels. Taking Xinjiang as an example, due to its distance from coastal areas, complex terrain and harsh climate conditions, cargo transportation takes a long time and the transportation cost is high.

For the flow of factors, we usually consider the following factors: human resources, capital and investment, technology and innovation factors, and natural resources

Human resources include labor force, technical talents and management talents, etc. In core areas, because economic activities are more intensive, more talents are attracted, making the mobility of human resources relatively high. In peripheral areas, due to the low level of economic development and relatively poor conditions for attracting talents, the mobility of human resources may be limited. China's coastal cities such as Shanghai and Guangzhou have developed industries and economies, attracting a large inflow of high-quality talents. For example, Shanghai Pudong New Area, as China's financial and commercial center, has attracted a large number of domestic and foreign financial institutions and multinational companies to set up

offices, thus attracting a large number of talents in finance, business, technology and other fields. In contrast, the brain outflow phenomenon in some inland areas is relatively prominent, and the mobility of talents is low. According to data from the National Bureau of Statistics, the population inflow rate and urbanization rate in coastal areas are generally high, while the population outflow rate in some inland areas is relatively high.

In terms of capital and investment, core areas usually have more developed financial systems and capital markets, making the flow of capital more convenient. Financial centers in China’s coastal areas have complete financial markets and financial service systems, attracting large amounts of capital inflows and investments. For example, the Shanghai Stock Exchange is one of the largest securities trading markets in China, with huge daily trading volume. In contrast, the financial markets in some inland areas are relatively weak, capital liquidity is restricted, and investment demand may be low.

In terms of science and technology and innovation elements, core areas often gather a large number of scientific research institutions, universities and innovative enterprises, forming a good innovation ecosystem and promoting the mobility of science and technology and innovation elements. Coastal areas have gathered a large number of universities, scientific research institutions and high-tech enterprises, forming a good innovation ecosystem and attracting the inflow of outstanding domestic and foreign scientific and technological talents and innovative resources. For example, Shenzhen, as China’s innovation center, has incubated many well-known technology companies and attracted a large number of entrepreneurs and scientific research talents. In peripheral areas, that is, inland areas, the mobility of technology and innovation factors may be limited due to their relatively low technological level and innovative capabilities.

Some inland areas are rich in natural resources, such as coal, iron ore, etc. However, due to remote geographical location or inconvenient transportation, the development and utilization of natural resources are subject to certain restrictions. In contrast,

natural resource utilization in coastal areas is more convenient and mobile.

In short, China's coastal areas have higher factor mobility than inland areas, which is reflected in many aspects such as human resources, capital and investment, technology and innovation factors, and natural resources. This difference has led to a higher level of economic development in coastal areas, while the development of inland areas faces certain challenges.

4.4 The formation and changes of spatial economic structure

The changes and development of China's spatial economic structure require a multi-dimensional comprehensive perspective, including historical background, geographical characteristics, policy drivers, etc. Before the reform and opening up (1949-1978), it belonged to the era of planned economy. The highly centralized planned economic system gives priority to the development of heavy industry. In addition, considering national security and strategic defense, many industrial bases are established in the inland, resulting in industrial layout mainly concentrated in the northeast and inland areas, such as the heavy industry base in the northeast and the resources in Inner Mongolia. development.

After the reform and opening up (1978 to present), special economic zones and opening-up policies were implemented: Shenzhen and other special economic zones were established in the early 1980s, and coastal areas took the lead in opening up, introducing foreign investment and market economic mechanisms to promote the rapid development of the southeastern coastal areas. Since the 1990s, the country has implemented a series of regional development strategies, such as the development of the western region, the revitalization of the old industrial base in the Northeast, and the rise of central China, in an attempt to narrow the regional development gap.

In terms of geographical location, the southeastern coastal area has attracted a large number of foreign investment and export-oriented enterprises due to its proximity to international trade corridors and convenient transportation conditions; as the inland

areas are far away from the coastline and major transportation hubs, development is relatively lagging behind. However, in recent years, it has gradually improved through the construction of transportation infrastructure. However, areas rich in natural resources such as coal and oil are located inland, such as Shanxi, Inner Mongolia, and Xinjiang, and have developed industries based on resource extraction.

Regarding the changes in the three major industries, through previous analysis we can find that there is a difference between inland and coastal areas in the proportion of the tertiary industry but not significant. However, the proportion of tertiary industry in northern China is relatively lower than that in southern China. This may be because the northern region is an old heavy industry base and they are in urgent need of economic transformation.

5. Competitive peripheries in China

Just as most of the world's wealth is concentrated in the hands of a few people, the world's top 15 Alpha cities have a total wealth value of US$24 trillion, accounting for approximately 11% of the world's total private wealth, according to market research company New World Wealth data from the latest report. In China, Alpha cities are mainly located in coastal such as Beijing, Shanghai, Guangzhou, Shenzhen, and Hong Kong. These cities are important centers of economic, political and cultural activities in China. They have developed infrastructure, educational resources and industrial structures, attract a large number of people and investments, and enjoy high living standards and employment opportunities. Around the core area of Alpha City, there are concentrated high-tech enterprises, financial institutions, government departments and higher education institutions, which form the economic lifeline and intellectual center of the city. China's most powerful high-tech companies such as Tencent, Alibaba, Baidu, Xiaomi, and Huawei are all located in these core areas, as are China's best higher education institutions such as Tsinghua University, Peking University, Fudan University, and Shanghai Jiao Tong University. Opposing it are relatively backward peripheral areas. In contrast, peripheral areas may face challenges in economic and social development. These areas may lack the resources and opportunities found in core areas, leading to population exodus, economic decline, and social inequality. For example, in the peripheral areas out of Alpha City, there may be problems such as few employment opportunities, backward infrastructure, and lack of educational resources, resulting in low living standards for residents. This antagonistic relationship between the core and the periphery exists not only economically, but also politically, culturally and socially. To give a simple example, in Shanghai, people love coffee even more than traditional tea. Shanghai is the city with the most cafes in China and even in the world. A report from Shanghai Municipal Commission of Commerce stated that Shanghai presently has 8,530 coffee stores in 2023 and accounting for 6.4 percent of the national total. Guangzhou, Beijing,

Chengdu, and Shenzhen are the next four cities in terms of the number of coffee stores in China. The Shanghai-style culture with local characteristics in Shanghai is gradually formed by absorbing the Wuyue culture and other regional cultures, and being influenced by the main Western cultures in the world. In Chengdu, as an inland city, traditional tea culture is still popular. Drinking tea in a bowl or cooking tea by the fire are the manifestations of the slow pace of life in this city.

However, as Professors Corò and Buciuni mention in the book “Periferie competitive”, there is life outside the Alpha City: knowledge, skills, projects to build original innovation and development paths. These competitive regions, even if they do not fall into the category of Alpha City, are able to generate sustainable growth processes and attract human, financial and technological resources. In the book, four cases are used in different geographical environments: Galway in Ireland, which is the innovation hub of biomedicine, North Carolina in the United States, which is the research triangle of the innovation ecosystem, the Ruhr belt in Europe, which is experiencing industrial transformation, and Emilia-Rome, Italy, has the new economies. They all have different industrial specializations and different evolutionary trajectories.

5.1 How to form a competitive periphery (3 factors)

In the book, Professors Corò and Buciuni identify three recurring factors in the development of regional competition:

1) Global connectivity. The first is the presence of multinational corporations within the region and effective links with the outside world. A multinational company exists in the form of setting up branches, offices or production bases in a certain country or region. These companies are usually enterprises from other countries that set up entities within the country to carry out business activities, including sales, production, research and development, etc. Their existence has an important impact on the local economy and can bring employment opportunities, technology transfer, capital investment, etc. At the same time, through these multinational companies, the country

or region achieves effective connections with other countries and regions through logistics and supply chains, information flows and personnel flows. By establishing a good logistics, information and personnel flow system, multinational companies can better utilize domestic resources and market opportunities, improve production efficiency and market competitiveness, thereby promoting the development of the local economy and improving the level of internationalization.

In addition, good infrastructure is also essential because it provides basic support for the smooth conduct of economic activities, such as transportation infrastructure, energy infrastructure, communication infrastructure, etc.

However, what is more critical is an open and innovative cultural atmosphere. By encouraging innovative thinking, respecting knowledge and expertise, supporting innovation and entrepreneurship, respecting diversity and inclusion, and valuing education and R&D, it can encourage companies and individuals to constantly seek new opportunities. ideas, new methods and new solutions to promote economic and social development. This cultural atmosphere will also attract more multinational companies to set up operations in the country and cooperate with local companies and talents to jointly promote economic development and improve international competitiveness.

At the same time, the relationship between regions and other regions is also crucial, because these relationships can promote the exchange and sharing of knowledge, technology and resources, thereby promoting economic development and promoting innovation. Different regions may have different professional knowledge, technology and experience. Through exchanges and cooperation, this knowledge can be disseminated and shared; different regions may face different challenges and needs. Through cooperation and exchanges, cross-border application of technology can be promoted. and innovation; different regions may have different natural resources, human resources and financial resources. Through cooperation and mutual assistance, complementary advantages and shared utilization of resources can be achieved.

2) Cooperation between education system and production system. First, cooperation

between the education system and the production system can promote the transfer and application of technology. Educational institutions (such as technical training institutions, university education and research centers) have rich technical resources and professional knowledge, and through cooperation with enterprises and institutions, these technical resources and knowledge can be transformed into actual productivity. Secondly, educational institutions can adjust curriculum according to market demand, cultivate high-quality talents that adapt to the market, and improve the skill level and employability of the workforce. Cooperation with enterprises and institutions can also provide students with internship and employment opportunities, helping them better integrate into society and the job market. In addition, cooperation between the education system and the production system can also promote the integration of industry, academia and research, and promote the transformation and application of scientific research results. University research centers cooperate with enterprises to carry out scientific research projects, which can transform scientific research results into actual productivity and promote technological innovation and industrial upgrading. Technical training institutions cooperate with enterprises to carry out skills training, which can impart the latest technical knowledge to employees and improve the production efficiency and competitiveness of enterprises. In short, the existence of technical training institutions, university education and research centers, and structured and mutually beneficial dialogue with local enterprises and institutions, educational institutions and enterprises can jointly leverage their respective advantages to achieve win-win cooperation and promote the development of the entire society and economy.

3) Entrepreneurship and finance refer to the environment for entrepreneurial and innovative activities in a region as well as the region’s financial system and market. It has a social attitude that promotes innovative projects, supports individuals who are willing to take risks, and favors public and private financial instruments and institutions that are guided by “systemic” interests, and be able to provide the patient capital needed for projects that pay off over the long term.

Specifically, a social attitude that is conducive to innovation means that society is open, inclusive, and supportive of innovators and entrepreneurs. In such an environment, people are more willing to accept new concepts and ideas, and are willing to take risks and try new business models and products, thus promoting the development of innovation and entrepreneurial activities. Secondly, public and private financial instruments and institutions can provide financial support, venture capital and financing services to provide necessary funds and resources for innovative projects and entrepreneurs. These financial tools and institutions should be able to understand and support the value of innovative projects, have investment patience and a long-term perspective, and be willing to provide financial support for projects with long-term returns. Finally, a healthy financial system and market can provide a stable financial environment and good investment opportunities, providing innovative projects and entrepreneurs with sufficient sources of funds and good investment channels. In addition, the development of the financial system and markets can also increase the risk tolerance of the economy and promote the development of innovation and entrepreneurial activities.

To sum up, an active and open entrepreneurial environment and a healthy financial system and market can create a good innovation environment and provide sufficient financial support, stimulate the vitality of innovative activities, and promote economic growth and progress.

5.2 Chongqing: New energy automobile industry cluster

Chongqing is an important city in inland southwest China and one of the four municipalities directly under the Central Government. It is located in the upper reaches of the Yangtze River, adjacent to Bashan Shu River, and has an excellent geographical location. Chongqing is world-famous for its majestic natural scenery, long history and culture, and spicy food. It is also one of China’s important old industrial bases, with a strong industrial foundation, complete categories, and strong

comprehensive supporting capabilities. Chongqing's motorcycle, automobile and accessories industries have national-level advantages. According to data from the National Bureau of Statistics of China, Chongqing ranked second in the country with a vehicle production of 2.3179 million units in 2023, reflecting the important status of Chongqing's automobile manufacturing industry.

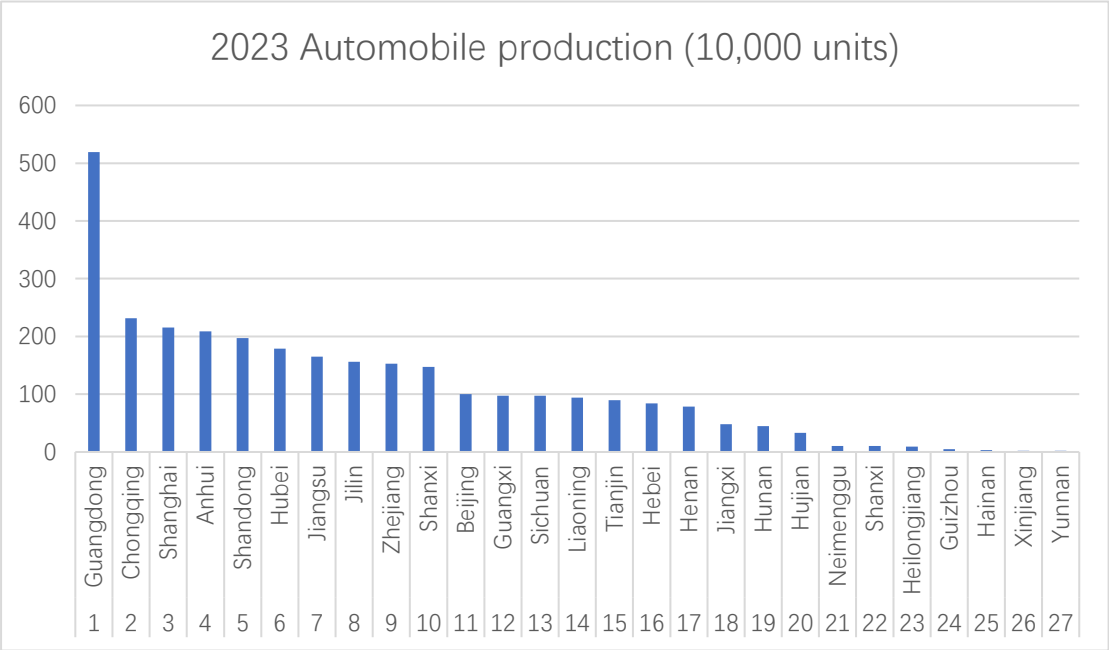

Figure 17: Automobile production by provinces and cities in China in 2023

With the increasing depletion of energy resources and the dual pressure of global warming, major automobile manufacturers in the world are investing funds and technology in research and development of new energy vehicles, and new energy vehicles have gradually become a new trend in the automobile industry. Chongqing, where the automobile industry is a key industry and the first pillar industry, is the earliest city in China to develop new energy vehicles.

According to the 2022 National Economic and Social Development Statistical Bulletin of the People's Republic of China, China's new energy vehicle production in 2022 is 7.003 million units, an increase of 90.5% over the previous year. In 2022, Chongqing's new energy vehicle output reaches 365,200 units, a year-on-year increase of 140%, and the growth rate is higher than the national average. In 2022, Chongqing's new energy vehicle output accounts for 5.21% of the country's total, and it is becoming an important new energy vehicle production base in the country. In

addition to its original industrial base, why has Chongqing developed into an important new energy vehicle base in China? We can analyze it based on the three factors previously derived by Professor Corò and Professor Buciuni:

Let's first analyze it from the perspective of global connectivity. Chongqing's new energy vehicle companies are led by Chang'an Automobile and Seres Group. The output of new energy vehicles from these two companies alone accounts for nearly 90% of the city's new energy vehicle output. Among them, Chang'an Automobile, as an old state-owned enterprise, has established cooperative relationships with a number of foreign automobile companies, including joint ventures such as Chang'an Suzuki, Chang'an Mazda, Chang'an Ford and Chang'an Peugeot Citroen. Instead, in 2016, the little-known Seres started from Silicon Valley in the United States and entered the new energy vehicle track. In 2021, Cyrus and Huawei worked in both directions to build the AITO brand and launched a comprehensive cooperation in the cross-border automotive business. Cooperation with multinational companies has strengthened the connection between local enterprises and the world, and has had a positive impact on technical communication, information circulation, and personnel mobility.

In addition, local automotive R&D talents and research institutions are rich in resources. Chongqing's numerous scientific research institutes and colleges and universities provide strong scientific and technological support and human resources guarantee for the research and development of new energy vehicles. Such as Chongqing Automobile Institute is a professional automotive training base in Chongqing and an automobile and motorcycle design and development base with independent intellectual property rights. It has cultivated a large number of professional talents for the development of Chongqing's automotive industry cluster. It is worth mentioning that in June 2009, the Chongqing Energy Saving and New Energy Vehicle Industry Alliance, led by Chang'an Automobile, was established, integrating vehicle companies, parts companies, scientific research institutes, and end users, striving to build the largest, most comprehensive and complete new energy vehicle industry chain in the central and western regions.

In terms of innovation and entrepreneurship, various encouraging policies have played an important role. Because Chongqing has a certain industrialization foundation, it has become the first city to apply the policy of “government subsidies for private consumers to purchase new energy vehicles” along with Beijing, Shanghai, Shenzhen, and Wuhan. Chongqing is also one of the first 13 pilot cities selected for the “Hundred Cities, Thousand Vehicles” energy-saving and new energy vehicle demonstration and promotion project launched by the Ministry of Science and Technology in 2009. In addition, according to the “Chongqing Development Plan for Building a World-class Intelligent Networked New Energy Vehicle Industry Cluster (2022-2030)”, as an important automobile production base in the country, Chongqing strives to form the prototype of a world-class intelligent connected new energy vehicle industry cluster by 2025, with the production and sales of intelligent connected new energy vehicles accounting for more than 10% of the country’s total.

At present, Chongqing’s automobile industry has formed a “1+10+1000” advantageous industrial cluster with Chang’an as the leader, more than a dozen vehicle companies as the backbone, and thousands of supporting companies as the support. In addition, Chongqing also has a complete supply system for major assemblies such as engines, transmissions, and braking systems, with a local matching rate of 70%. With the rapid development of the new energy vehicle industry, the export of new energy vehicles has also continued to grow. Especially along the “One Belt and One Road” initiative, the “Chongqing-Xinjiang-Europe” freight train brings new opportunities to Chongqing’s automobile export market.

5.3 Wuhan: Biomedicine industry cluster

Judging from the overall development of the domestic biopharmaceutical industry, traditional advantageous parks are mainly concentrated in the Yangtze River Delta, Beijing-Tianjin-Hebei and Pearl River Delta regions. However, with the development of these industry parks, the spatial carrying capacity has gradually declined. The

problem of rapidly rising production and living costs has gradually become more prominent, and companies have a clear tendency to spill over.

Some cities in the central and western regions are becoming new choices for biopharmaceutical companies to relocate due to their good foundations in the biopharmaceutical industry, strong support from local government policies and obvious advantages in production and living costs. Taking Central China as an example, around Wuhan City in Hubei Province as the core of development, a number of high-quality key biopharmaceutical industry parks are emerging, forming a spatial pattern of point-like development.

Let's take a look at the characteristics of Wuhan's biopharmaceutical industry development:

- Rapid growth in industry scale

From 2015 to 2019, the added value of Wuhan's biomedicine and medical device industry increased year by year. In 2019, the added value of Wuhan's biomedicine and medical device industry reached 18.356 billion yuan. Affected by the epidemic in 2020, the added value of Wuhan's biomedicine and medical device industry fell to 12.96 billion yuan.

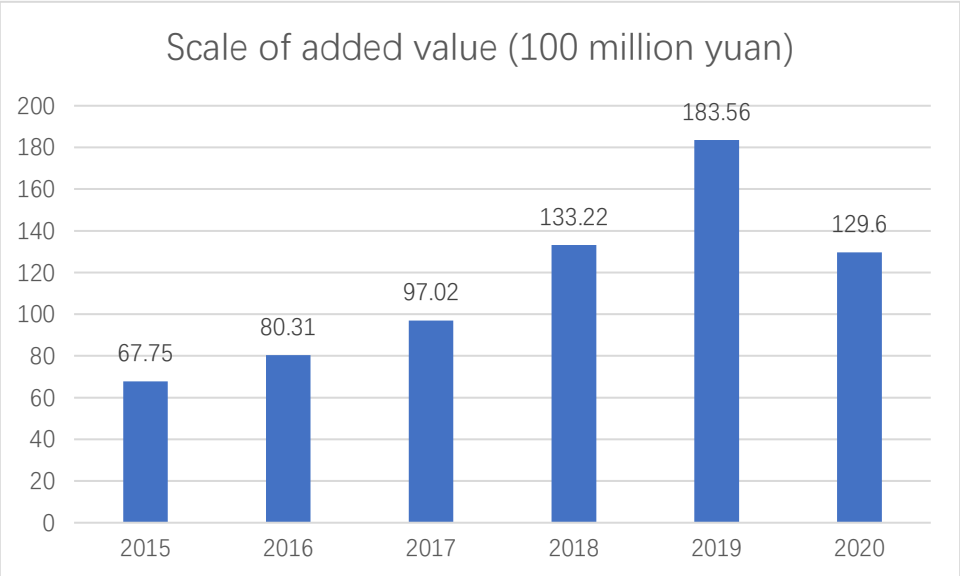

Figure 18: Value-added scale of Wuhan's biomedicine and medical device industry from 2015 to 2020 (unit: 100 million yuan)

- The number of enterprises continues to increase

From 2019 to 2021, the number of biopharmaceutical companies in Wuhan will show an upward trend. As of the end of 2021, there were 704 biomedicine-related companies in Wuhan, accounting for 2.8% of the number of companies in the country. Judging from the spatial layout of key enterprises, Wuhan Donghu High-tech Zone has a relatively large number of biopharmaceutical enterprises. For example, companies such as Renfu Pharmaceutical, Youzhiyou Biotech, Heyuan Biotech, and Dingkang Biotech are all located here. Wuhan has gradually formed a biomedical industry gathering place with Optics Valley Biocity as the core.

- Complete biopharmaceutical industry chain

Wuhan's biopharmaceutical industry chain is relatively complete, with a rich variety of biopharmaceutical products, including biological drugs, chemical drugs, modern traditional Chinese medicine and other categories, as well as related industries such as biological services. It has gathered leading biopharmaceutical companies such as Renfu Pharmaceutical and Youzhiyou Biotech. Wuhan is also constantly introducing and cultivating leading biopharmaceutical companies. Domestic biopharmaceutical leaders such as Shenzhen Mindray, Shanghai United Imaging, and Shenzhen BGI are constantly settling in Wuhan to expand Wuhan's biopharmaceutical industry chain.

How did Wuhan, as an inland city in China, gain a competitive position in the biomedical industry?

- Element of innovation

Wuhan has 92 universities, 1.3 million college students, 75 academicians, and 47 top-level hospitals such as Tongji and Xiehe. It trains more than 50,000 talents in the field of health every year, ranking among the top cities of its kind in the country; it has 17 nationally recognized key laboratories and engineering technology research centers in the biomedical industry, and 13 national-level biomedical industry incubators. The National Genetic Testing Technology Application Demonstration Center and Asia's

first biosafety level 4 laboratory were built. Wuhan Institute of Biotechnology has been recognized as a national technology transfer demonstration institution.

- Industrial policy

It's about strengthening the top-level design of industrial development and expanding related industrial chains. During the COVID-19 period, in order to implement Hubei Province's "Several Opinions on Accelerating the Development of the Big Health Industry in Hubei Province" and respond to the challenges and opportunities brought by the COVID-19 epidemic, Wuhan City compiled and released the "Implementation Opinions on Accelerating the Development of the Big Health Industry in Wuhan City". The implementation opinions will focus on the five major areas of Wuhan's comprehensive health industry development: biomedicine, medical equipment, pharmaceutical circulation, biological agriculture, and health services, clarify development priorities, and formulate key measures and organizational safeguards.

At the same time, the local government has thoroughly implemented the "Wuhan City Big Health Industry Development Plan (2019-2035)" and formulated implementation details for special policies to support new drug research and development, consistency evaluation of generic drugs and so on, strengthened fiscal and financial support, expanded the amount of policy-based relief subsidized loans from 60 billion yuan to 100 billion yuan, and established a 22 billion yuan comprehensive health industry development fund; it also optimized the entrepreneurial business environment, 49 biopharmaceutical industry talents were selected into the "Wuhan Talent Plan" to facilitate market access for biopharmaceutical companies and opened up green channels for relevant approvals.

In short, according to the areas where the global bio-industry focuses, the conditions for its success are strong technology; secondly, it must have a complete manufacturing industry chain; third, it needs to adopt an open innovation mentality to accept these new technologies and new industries and achieve local implementation;

the fourth is to carry out corresponding industry focus around the upstream R&D platform.

With the globalization of knowledge, capital and the development of information technology, the innovation and development model of the biomedical industry has been transformed into an open one. Wuhan Biomedical Innovation relies on its industrial foundation, learns from the urban innovation experience of developed countries, realizes resource sharing and differentiated collaborative development, and enters a new stage of upgrading the biomedical innovation industry.

6. Regional economic policy

6.1 The evolution of regional economic policy

Previously, we analyzed China's Temporal Dynamics of Regional Disparities. Next, we will use the National Five-Year Plan as the main basis and combine the contents of several important conferences to systematically analyze the transformation and historical evolution of China's regional economic development policies and their impact on regional economic development.

Since the founding of the People's Republic of China in 1949, China's regional development policy has undergone a series of changes from scratch to a variety of fields. Please see the following table for details.

Development stage/strategy	**Year**	**Specific plan**	**Major conferences and specific regional policies**
Balanced development strategy (1949-1978)	1949-1953	Economic recovery period	The Second Plenary Session of the 7th Central Committee of the CPC: The focus of work shift from rural areas to cities, gradually restore and develop production, and balance the national industrial layout.
	1953-1957	"First Five-Year Plan"	The 8th National Congress of the CPC: Plan to balance the national industrial layout and strive to build a great socialist China
	1958-1962	"Second Five-Year Plan"	The 2nd Plenary Session of the 8th Central Committee of the CPC: The national economy has experienced serious imbalances. It is necessary to adjust the relationship between the importance of agriculture and the internal industry.
	1966-1970	"Third Five-Year Plan"	The 11th Session of the 8th Party Congress: "Decentralization, backing, and concealment" adjust the proportion of infrastructure investment in the mainland to balance the national economic

				development
		1971-1975	"Forth Five-Year Plan"	The 3rd Plenary Session of the 11th Central Committee of the CPC: Establishing a coordinated economic cooperation zone to promote the construction of inland departments and the coordinated development of industry and agriculture
disequilibrium development strategy (1978-1992)		1976-1980	"Fifth Five-Year Plan"	The 3rd Plenary Session of the 11th Central Committee of the CPC: focusing on reform and opening up, shifting to the construction of "big three fronts", and unbalanced regional development has begun
		1981-1985	"Sixth Five-Year Plan"	The 3rd Plenary Session of the 12th Central Committee of the CPC: Adjust the policy and propose different development directions for coastal, inland and ethnic minority areas
		1986-1990	"Seventh Five-Year Plan"	The 3rd Plenary Session of the 13th Central Committee of the CPC: Accelerate the development of the eastern coastal zone and focus on energy and raw material construction in the central region
		1991-1995	"Eighth Five-Year Plan"	The 14th National Congress of the CPC: Correctly handle the relationship between coastal and inland, economically developed and underdeveloped areas, and give full play to regional advantages
Regional coordinated development strategy (1992 till now)	***Coordinate the regional balanced development strategy (1992-2012)***	1996-2000	"Ninth Five-Year Plan"	The 15th National Congress of the CPC: Adhere to regional economic coordination and gradually narrow regional development gaps
		2001-2005	"Tenth Five-Year Plan"	The 16th National Congress of the CPC: Coordinate the implementation of the regional strategy of developing the western region, promoting the rise of the central region, and encouraging the eastern region to take the lead in development.

		2006-2010	"Eleventh Five-Year Plan"	The 17th National Congress of the CPC: A series of policy documents for the construction of urban agglomerations and main functional areas were issued, with more emphasis on regional coordination and sustainable development.
	New Balance Strategy (2012 to present)	2011-2015	"Twelfth Five-Year Plan"	The 18th National Congress of the CPC: The issue of "imbalance" has been highly valued, emphasizing the strategic support role of urban agglomerations in the layout of productivity.
		2015-2020	"Thirteenth Five-Year Plan"	The 19th National Congress of the CPC: giving new meaning to coordinated regional development and highlighting strategies such as "One Belt and One Road" construction and urban agglomeration construction
		2020-2025	"Fourteenth Five-Year Plan"	The Fifth Plenary Session of the 19th Central Committee of the CPC: Optimize the spatial layout of land and promote coordinated regional development and new urbanization

Table 4: The evolution of China's regional economic development policies since the founding of New China

As shown in table 4, China's regional economic development strategy has gone through three stages: "balanced development → unbalanced development → coordinated development". At different stages of development, corresponding regional development policies were implemented, which played an important role in promoting the rapid development of regional economy.

In terms of stages, from the 1950s to the late 1970s (i.e. the period of the "First Five-Year Plan" to the "Fourth Five-Year Plan"), China's regional policies gradually tilted towards inland areas and border ethnic minority areas, aiming to change the situation where industrial development was overly dependent on the eastern coastal areas, so as to support the realization of relatively balanced development of the national economy.

From the reform and opening up to Deng Xiaoping's Southern Tour (i.e. the period of the Fifth Five-Year Plan to the Eighth Five-Year Plan), the center of gravity of China's economy gradually concentrated on the coastal areas, forming a pattern of unbalanced development, in which the status of the three major economic belts gradually strengthened. Although this strategy promoted the rapid growth of China's economy, it also led to the widening of regional economic gaps.

From 1992 to 2012 (i.e. the period of the Ninth Five-Year Plan to the Eleventh Five-Year Plan), China's regional development has undergone major transformation and adjustment. With the continuous reduction of the scale of regional planning, a full-scale regional opening pattern characterized by free trade zones and pilot zones has gradually formed, and China's economy has gradually entered a stage of coordinated development.

From the 12th Five-Year Plan to the 14th Five-Year Plan, China has entered a new era. During this period, the problems of unbalanced and inadequate development have received much attention, and the coordinated development of urban agglomerations, regional integrated development, and regional coordinated development strategies have become the focus of attention from all walks of life. During this stage, China's regional economic development is gradually entering the stage of "new balance strategy".

According to renowned economist Yukon Huang, China's development was based on a series of pragmatic, sometimes trial-and-error reforms that worked with, rather than against, the country's geographic and inherited advantages.

These policies had three clear consequences: 1) they reshaped the spatial dimensions of development, including regional concentration and rural-urban dynamism; and 2) they broke the deadlock in the flow of labor, capital, and goods, both across provinces and between urban and rural areas within the country, and between China and the rest of the world. 3) However, they have also triggered forces that have widened disparities between regions, between urban and rural areas, and within urban and rural

areas.[6]

Next, we will make a detailed and in-depth analysis of China's major strategies for regional economic policies.

6.2 Major strategies and regional convergence

6.2.1 Construction of the Guangdong-Hong Kong-Macao Greater Bay Area

In 2009, Guangdong, Hong Kong and Macao conducted research on the coordinated development of the Greater Pearl River Delta urban cluster and proposed the "Bay Area Development Plan". In 2014, Shenzhen proposed to build a "Bay Area Economy". In 2016, "Joining hands with Hong Kong and Macao to build the Guangdong-Hong Kong-Macao Greater Bay Area" was written into the Guangdong Provincial Government Work Report. In 2017, the "Guangdong-Hong Kong-Macao Greater Bay Area" was specifically mentioned in the highest-level national documents. In February 2019, the CPC Central Committee and the State Council issued the Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area.

Figure 19: Map of Guangdong-Hong Kong-Macao Greater Bay Area

[6] Yukon Huang, "Reinterpreting China's Success Through the New Economic Geography," n.d.

The Guangdong-Hong Kong-Macao Greater Bay Area includes the Hong Kong Special Administrative Region, the Macao Special Administrative Region and the cities of Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen and Zhaoqing in Guangdong Province (hereinafter referred to as the Nine Cities in the Pearl River Delta), with a total area of 56,000 square kilometers and a total population of approximately 70 million at the end of 2017. It is one of the most open and economically dynamic regions in China and plays an important strategic role in the overall national development.

At the regional development level, the construction of the Greater Bay Area is mainly divided into the following three parts:

1) Building a networked spatial pattern with poles driving and axis belts supporting.

The pole driving is mainly the leading and driving role of the strong combination of Hong Kong-Shenzhen, Guangzhou-Foshan, and Macau-Zhuhai. The axis belt support mainly relies on the rapid transportation network with high-speed railways, intercity railways and high-grade highways as the main body, as well as the port group and airport group, to build a regional economic development axis belt and form a networked spatial pattern with efficient connections between major cities.

2) Improving the urban agglomeration and urban development system

The Guangdong-Hong Kong-Macao Greater Bay Area consists of “9+2” cities: 9 cities in Guangdong (Guangzhou, Foshan, Zhaoqing, Shenzhen, Dongguan, Huizhou, Zhuhai, Zhongshan, Jiangmen) + 2 special administrative regions of Hong Kong and Macau. With the four central cities of Hong Kong, Macau, Guangzhou and Shenzhen as the core engines of regional development, radiate and drive the surrounding areas.

The positioning of the four central cities of Hong Kong, Macao, Guangzhou and Shenzhen are as follows:

Hong Kong: Consolidate and enhance the status of an international financial, shipping and trade center, strengthen the functions of global offshore RMB business and international asset management center, promote the development of finance, trade,

logistics and other industries towards high-end and high-value-added directions, cultivate emerging industries, and create a more competitive international metropolis.

Macao: Build a world tourism and leisure center and a trade and business cooperation service platform between China and Portuguese-speaking countries, promote economic diversification, and build a cultural exchange and cooperation base.

Guangzhou: Give full play to the leading role of national central cities and comprehensive gateway cities, enhance the functions of international trade centers and comprehensive transportation hubs, enhance the functions of science, technology, education and culture centers, and strive to build an international metropolis.

Shenzhen: Give full play to the leading role of special economic zones, national economic center cities and national innovative cities, accelerate the construction of modern international cities, and become a city of innovation and creativity.

These goals are aimed at promoting the coordinated development of cities in the Guangdong-Hong Kong-Macao Greater Bay Area in the fields of economy, finance, science and technology, culture, etc., and enhance the international competitiveness and influence of the entire region.

For surrounding cities such as Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, Zhaoqing, etc., the main thing is to give full play to their own advantages, deepen reform and innovation, enhance the comprehensive strength of the city, and enhance the competitiveness of the cities. By strengthening interactive cooperation with the central cities, and driving the development of surrounding characteristic towns, it could jointly improve the development level of the urban agglomeration.

On the other hand, it is to promote the integrated development of urban and rural areas by establishing and improving the institutional mechanisms and policy systems for the integrated development of urban and rural areas, promoting the development of urbanization, and improving the quality of urbanization.

3) Radiating and driving the development of the Pan-Pearl River Delta region

The radiation and leading role of the Guangdong-Hong Kong-Macao Greater Bay Area is mainly exerted through the overall planning of the productivity layout of the

nine cities in the Pearl River Delta and the eastern, western and northern regions of Guangdong.

With the Guangdong-Hong Kong-Macao Greater Bay Area as the leader and the Pearl River-Xijiang Economic Belt as the hinterland, its economic influence can reach central, southern and southwestern China, and even Southeast Asia and South Asia.

Transportation infrastructure is particularly important here. The transportation network from the Greater Bay Area to other provinces and regions in the Pan-Pearl River Delta region needs to be improved to promote the flow of factors and industrial transfer in the Pan-Pearl River Delta region. Relying on coastal railways, high-grade highways and important ports, the Guangdong-Hong Kong-Macao Greater Bay Area will achieve coordinated development with the city clusters on the west coast of the Taiwan Strait and the Beibu Gulf city clusters. Relying on transportation channels such as high-speed railways, trunk railways and highways, deepen the cooperation and exchanges between the Greater Bay Area and the central and southern regions and the middle reaches of the Yangtze River, and strengthen the radiation and driving role of the Greater Bay Area on the southwest region. In this way, we can deepen regional cooperation, orderly develop the “enclave economy”, and form an industrial cooperation system with gradient development, reasonable division of labor and complementary advantages.

The construction of the Guangdong-Hong Kong-Macao Greater Bay Area is of great significance. First, it closely combines the core area of the Pearl River Delta with the surrounding peripheral areas to form an integrated economic coordinated development. By strengthening the connection and interaction between the core area and the surrounding areas, we can achieve the optimal allocation of resources and the complementary development of industries, thereby promoting the development of the entire regional economy.

Secondly, the construction of the Guangdong-Hong Kong-Macao Greater Bay Area can strengthen the unified management and governance of the Guangdong-Hong

Kong-Macao region at the political level and promote the practice of “one country, two systems”. At the same time, it is also conducive to deepening the cooperation between the mainland and Hong Kong and Macao, promoting the development of Hong Kong and Macao, and maintaining the long-term prosperity and stability of Hong Kong and Macao.

In general, the construction of the Guangdong-Hong Kong-Macao Greater Bay Area can be understood as an important strategic measure taken by the Chinese government based on the center-periphery model. On the basis of maintaining the original economic achievements of the core area, it aims to achieve economic coordinated development, enhance international competitiveness and promote economic transformation and upgrading. It has important strategic significance and far-reaching impact.

6.2.2 Integrated development of the Yangtze River Delta

The Yangtze River Delta includes the entire area of Shanghai, Jiangsu, Zhejiang and Anhui provinces (an area of 358,000 square kilometers). The central area is 27 cities, including Shanghai, Nanjing, Wuxi, Changzhou, Suzhou, Nantong, Yangzhou, Zhenjiang, Yancheng and Taizhou in Jiangsu Province, Hangzhou, Ningbo, Wenzhou, Huzhou, Jiaxing, Shaoxing, Jinhua, Zhoushan and Taizhou in Zhejiang Province, and Hefei, Wuhu, Ma’anshan, Tongling, Anqing, Chuzhou, Chizhou and Xuancheng in Anhui Province (an area of 225,000 square kilometers).

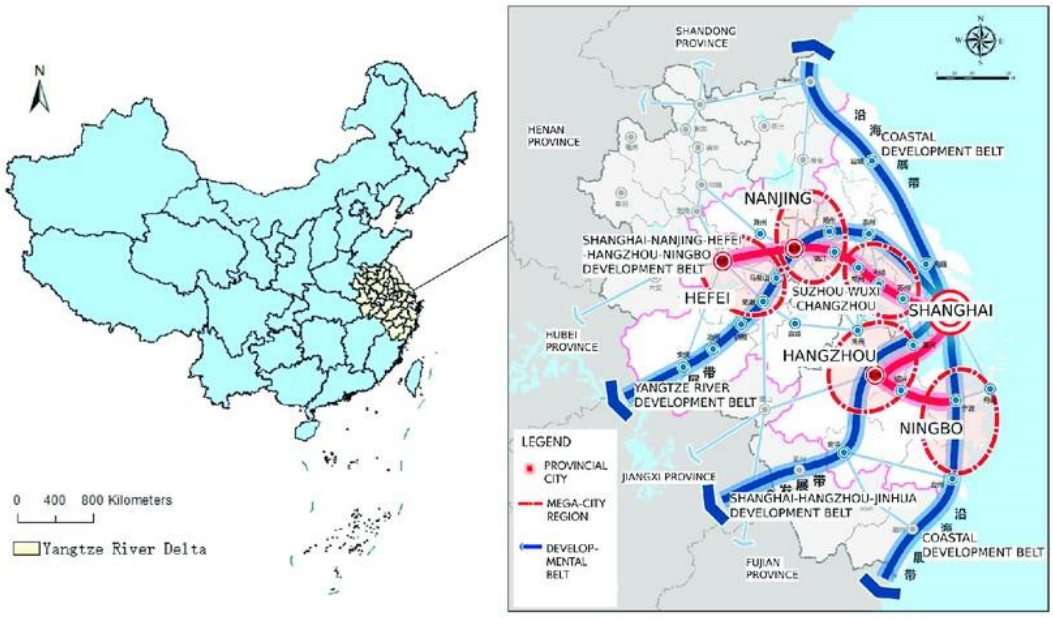

Figure 20: Map of the Yangtze River Delta

The region has superior location conditions, excellent natural endowments, a strong economic foundation, a relatively complete system, a complete urban system, and developed science, education and culture. It has become one of the regions in China with the best development foundation, the best institutional environment, and the strongest overall competitiveness. It has a very important strategic position in the overall process of China's socialist modernization.

On November 5, 2018, Xi Jinping announced at the first China International Import Expo that the integrated development of the Yangtze River Delta region would be elevated to a national strategy.

The Outline of the Yangtze River Delta Regional Integrated Development Plan is to build a new pattern of coordinated development with regional linkage and collaboration, urban-rural integrated development, and full play of advantages, mainly in the following aspects:

1) Regional development will be centered on Shanghai, with Jiangsu, Zhejiang, and Anhui each making the most of their strengths to strengthen cross-regional

coordination and interaction

Improving Shanghai's service functions mainly revolves around the construction of the "five centers" of international economy, finance, trade, shipping and technological innovation, improving comprehensive economic strength, financial resource allocation, trade hub, high-end shipping services and technological innovation capabilities, and enhancing Shanghai's urban capabilities and core competitiveness.

Jiangsu, Zhejiang and Anhui have different positioning:

Jiangsu uses its manufacturing, scientific and educational resources and open advantages to promote the construction of industrial innovation belts and independent innovation demonstration zones, and build a global science and technology industry innovation center and advanced manufacturing base;

Zhejiang uses its digital economy, ecological environment and private economy advantages to build a digital economy innovation highland, an open hub and a green development benchmark;

Anhui is relatively backward in this area, so it needs to use its manufacturing characteristics and ecological resource advantages to build a source of scientific and technological innovation and a gathering place for emerging industries

Strengthening regional cooperation and linkage mainly includes strengthening cooperation among cities in the central area and strengthening cooperation between the central area and relatively backward areas such as northern Jiangsu, southwestern Zhejiang, and northern Anhui, so as to drive the coordinated development of surrounding areas.

2) Accelerating the integrated development of metropolitan areas

Shanghai and the surrounding areas and Suzhou, Wuxi and Changzhou metropolitan areas will develop in a coordinated manner to build the Shanghai metropolitan area; The Nanjing metropolitan area will develop in a coordinated manner with the Hefei metropolitan area; The Hangzhou metropolitan area and the Ningbo metropolitan area will closely connect and cooperate with each other to achieve the integration of Hangzhou, Shaoxing and Ningbo; Building the Ningbo-Hangzhou ecological

economic belt could strengthen the coordinated linkage between the Nanjing metropolitan area and the Hangzhou metropolitan area.

3) Promoting the integrated development of urban and rural areas

It is mainly implemented through the four aspects of urban and rural infrastructure connectivity, urban and rural public service integration, urbanization, and rural development quality.

From the perspective of China's regional development, the integration of the Yangtze River Delta is of great significance:

According to the core-periphery theory, Shanghai is a core city with significant advantages and dominant positions in economy, finance, trade, shipping, and technological innovation. Southern Jiangsu and Zhejiang are relatively developed regions and core regions, while northern Jiangsu and Anhui are relatively less developed in terms of economic development and resource allocation and are considered peripheral regions.

In terms of division of resources and functions, Shanghai has concentrated a large number of high-end service functions, international financial resources, innovative technology resources, etc. Jiangsu, Zhejiang and Anhui have their own advantages in manufacturing, digital economy, ecological environment and other aspects. By complementing their functions with Shanghai, they can achieve optimal allocation of resources and common development.

In terms of economic activities and resource flows, Shanghai drives the development of surrounding areas through its strong economic and financial radiation capabilities. Through connections with core cities and knowledge spillover effects, surrounding areas can acquire capital, technology and management experience to improve their own development levels. At the same time, manufacturing and innovation achievements from surrounding areas can flow back to Shanghai through logistics and supply chains, promoting the improvement of its trade and technological innovation functions.

To sum up, from the perspective of peripheral core theory, the integration of the Yangtze River Delta achieves optimal resource allocation and coordinated development within the region through the leading role of the core city and the complementary functions of peripheral areas. Establishing effective cooperation mechanisms and infrastructure connectivity is the key to promoting integrated development. At the same time, attention needs to be paid to balanced development and coordination between the core and the periphery.

6.2.3 Coordinated development of Beijing-Tianjin-Hebei (BTH)

The BTH region is located in the heart of the Bohai Sea Rim in Northeast Asia, China, covering an area of about 218,000 km² and a population of 109.7 million (2022). It is the largest and most dynamic region in northern China, with a regional GDP of 10.0 trillion yuan (2022)

BTH Urban Agglomeration is China's "capital economic circle", including the two municipalities of Beijing and Tianjin, and also includes Baoding, Tangshan, Langfang, Shijiazhuang, Qinhuangdao, Zhangjiakou, Chengde, Cangzhou, Hengshui, Xingtai, Handan, and Anyang in Hebei Province. Among them, Beijing, Tianjin, Baoding, and Langfang are the core functional areas in the central region, and the Beijing-Tianjin-Hebei region takes the lead in linkage development.

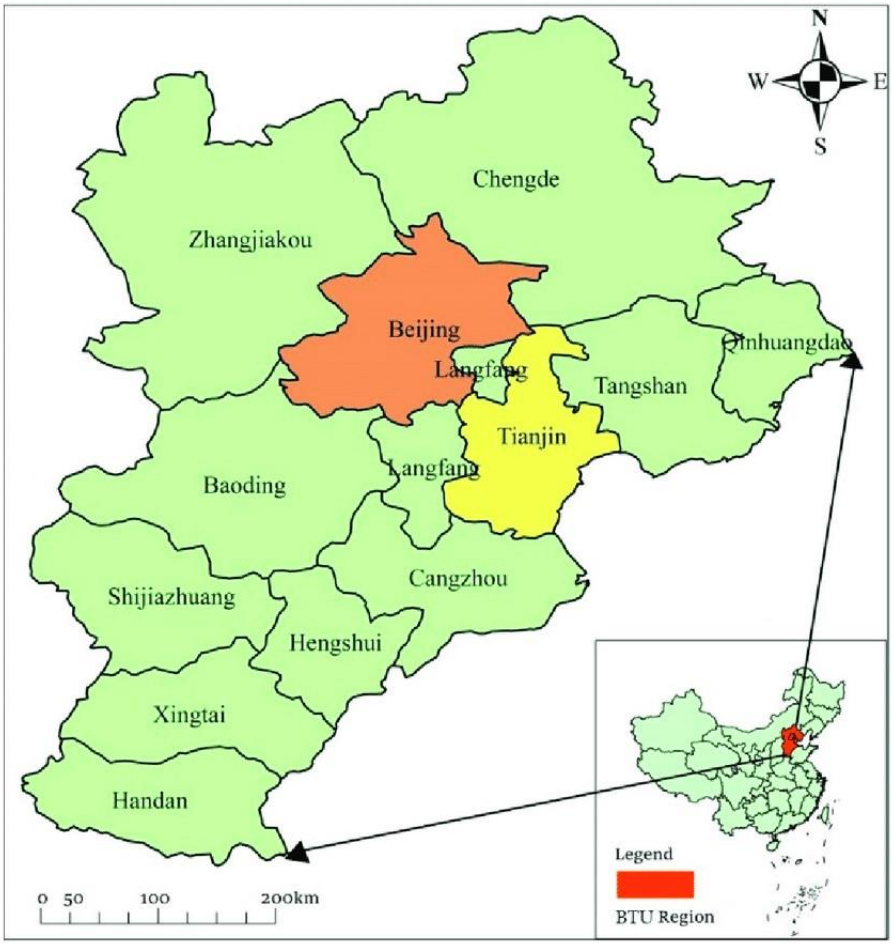

Figure 21: Map of BTH

On April 30, 2015, the Political Bureau of the CPC Central Committee reviewed and approved the Outline of the Coordinated Development Plan for the BTH region, which pointed out that promoting the coordinated development of the BTH region is a major national strategy, and its core is to orderly decentralize Beijing's non-capital functions. But why?

In fact, Beijing was facing increasingly severe population, resource and environmental pressures in the process of rapid development, the most prominent manifestation of which was the excessive population expansion. By the end of 2014, Beijing's permanent population reached 21.516 million, of which 12.763 million were in the six urban districts. Problems such as water shortage, air pollution, traffic congestion and insufficient ecological environment capacity had become prominent. We can call it "Big city disease".

The root causes of Beijing's big city disease are mainly in two aspects: one is that there are too many concentrated functions, especially the low level of industrial structure, and there is no pattern of dislocation and interactive development with surrounding regions and cities. In this case, Beijing, with its powerful siphon effect, has concentrated too many resources, become fat and bloated, and has serious big city disease. At the same time, Tianjin and Hebei are facing resource loss, especially the surrounding cities and counties in Hebei, which are not well fed and suffer from anemia, and the so-called poverty belt around the capital has emerged.

Another root cause of Beijing's big city disease lies in the irrational spatial structure of Beijing's urban development. For a long time, Beijing's urban construction has adopted the "spreading out" and separation of work and residence methods, rather than the urban circle method of core area plus satellite cities, and the urban agglomeration method of coordinated development with surrounding regional cities, which inevitably leads to a series of problems such as traffic congestion.

Therefore, the Outline of the Coordinated Development Plan for the BTH region is a common need to solve Beijing's big city problems and promote the coordinated development of the BTH region.

First, it needs to make Beijing slimmer and stronger, and make the surrounding areas grow and fatter. The two are complementary. If Beijing is not slimmer, there will be no space to develop more advantageous industries and it will not be able to become stronger. If the surrounding areas do not grow, they will not be able to support the function of Beijing as a capital, and Beijing's strength will lack a solid foundation.

Secondly, on the one hand, it needs to accelerate the development of the capital city circle, build satellite cities with decentralized functions as the starting point, and try to achieve the integration of work and residence to reduce traffic flow. At the same time, on the basis of overall planning, it needs to strengthen coordination and cooperation with surrounding cities in terms of industrial layout, infrastructure construction, environmental protection, etc., and accelerate the construction of a world-class city

cluster with the capital as the core.

The high-quality development of key areas has achieved remarkable results. The reform and opening up of Tianjin Binhai New Area have achieved practical results. In 2023, the container throughput of Tianjin Port will exceed 22 million TEUs. In Hebei, Zhangjiakou City has accelerated the construction of the capital's water conservation functional area and ecological environment support area, and Tangshan has completed the "14th Five-Year Plan" target task of reducing energy consumption per unit of GDP ahead of schedule.

The construction of an integrated transportation network has been accelerated, and a 1 to 1.5-hour transportation circle for major cities has basically been formed. The results of ecological collaborative governance are obvious. In 2023, regional PM2.5 will drop by nearly 60% compared with 2014. The upstream and downstream collaboration of the industrial chain continues to strengthen. Zhongguancun enterprises have established more than 10,000 branches in Tianjin and Hebei, and the transaction volume of technical contracts from Beijing to Tianjin and Hebei has exceeded 280 billion yuan.

The decentralization of Beijing's non-capital functions is actually about handling the relationship between the core and the periphery. If the excessive functions concentrated in Beijing are not decentralized, it will be impossible to free up resources and space for the upgrading of Beijing's economic structure, and Beijing's big city problems will not be solved, making it difficult to give full play to the four major functions. On the other hand, if Beijing's non-capital functions are not decentralized, it will be impossible to form a pattern of staggered development between Beijing and Tianjin and Hebei, and it will be difficult to form a situation of coordinated development. Of course, decentralization is not a simple transfer, but a transfer based on transformation and upgrading. Through such a transfer, the development of Tianjin and Hebei can be promoted. At the same time, a pattern of

division of labor, cooperation, and complementary advantages can be formed between Beijing, Tianjin and Hebei to promote common development.

In promoting the coordinated development of Beijing, Tianjin and Hebei, the role of the government is definitely indispensable, but it is not enough to rely solely on the role of the government. The main approach is “market-led, government-guided”. The role of the government should be mainly reflected in the following aspects: first, the control and guidance of planning, including both spatial planning and industrial planning; including both overall regional planning and local and relevant urban planning. It is not difficult to find that the role of the government is enormous in China’s economic construction.

6.2.4 Development of the Yangtze River Economic Belt

The Yangtze River Economic Belt covers 11 provinces and cities, including Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan, Chongqing, Sichuan, Yunnan, and Guizhou, with an area of about 2.0523 million square kilometers, accounting for 21.4% of China, and its population and GDP both exceed 40% of the whole of China.

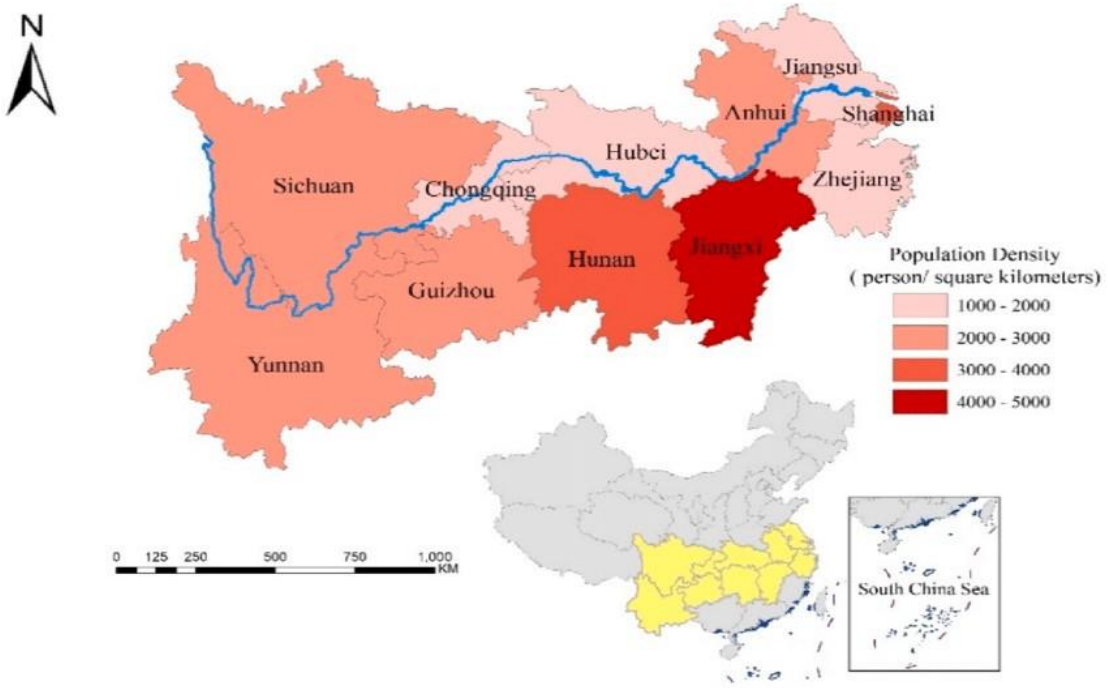

Figure 22: Map of the Yangtze River Economic Belt

From the development process, in the early 1990s, China took the lead in the development and opening up of Shanghai Pudong, and kicked off the comprehensive development of the Yangtze River Economic Belt. After more than 20 years of development and construction, the comprehensive transportation channel of the Yangtze River Economic Belt has been initially formed, the advantages of industrial development have been continuously strengthened, and the strategic pattern of urbanization has been basically formed. Its strategic position in China's development pattern has become increasingly prominent.

However, the development of the Yangtze River Economic Belt also faces many difficulties and problems, such as severe ecological and environmental situation, prominent regional development imbalance, arduous tasks of industrial transformation and upgrading, and unclear regional cooperation mechanism.

In September 2016, the Outline of the Development Plan for the Yangtze River Economic Belt was officially issued, establishing a new development pattern of the Yangtze River Economic Belt with "one axis, two wings, three poles, and multiple points": "One axis" refers to relying on the golden waterway of the Yangtze River, giving full play to the core role of Shanghai, Wuhan and Chongqing, and taking the main towns along the river as nodes to build a green development axis along the river. "Two wings" refers to giving full play to the radiation and driving role of the main axis of the Yangtze River, extending and expanding to the hinterland on both sides of the north and south, and enhancing the supporting capacity of the north and south wings. "Three poles" refers to taking the Yangtze River Delta urban agglomeration, the middle reaches of the Yangtze River urban agglomeration, and the Chengdu-Chongqing urban agglomeration as the main body, giving full play to the radiation and driving role, and creating three major growth poles in the Yangtze River Economic Belt. "Multiple points" refers to giving full play to the supporting role of

prefecture-level cities outside the three major urban agglomerations, based on the carrying capacity of resources and the environment, constantly improving urban functions, developing advantageous industries, building characteristic cities, strengthening economic ties and interactions with central cities, and driving regional economic development.

The Outline has been implemented for eight years. The industrial layout of the Yangtze River Delta Economic Zone is basically driven by the lower reaches of the Yangtze River Delta and extends to the middle and upper reaches of the Yangtze River. In the previous chapter, we analyzed Chongqing's new energy vehicle industry. We still take the new energy vehicle industry as an example.

The automobile industry is one of the largest industrial industries, and the Yangtze River Economic Zone is China's largest automobile industry "aggregation belt". In 2023, at the Shanghai Waigaoqiao Haitong International Automobile Terminal, an average of about 3,000 cars departed from here every day and were sold to more than 100 countries and regions around the world.

With the development trend of electrification and intelligent networking, provinces and cities along the Yangtze River are promoting transformation through innovation and moving towards high-quality development. In Shanghai, Tesla's Shanghai Super Factory has become its main export center in the world, accounting for more than half of Tesla's global production capacity; the international competitiveness of "SAIC-made" new energy vehicles has steadily improved.

Going up the river, in Chongqing, 16 new energy vehicle companies have comprehensively deployed multiple technical routes such as pure electric, plug-in, battery swap, extended-range, and hydrogen fuel. Many emerging brands such as Chang'an Deep Blue, Avita, and Seres are accelerating their rise, and a trillion-level intelligent connected new energy vehicle industry cluster is about to emerge.

There are two key factors in the construction of the entire Yangtze River Economic Belt: one is the functional positioning of the urban agglomeration in the Yangtze River

Economic Belt, and the other is the coordination mechanism of the urban agglomeration.

The urban agglomeration in the upper reaches of the Yangtze River aims to promote green development and plan and build a shipping development strategy. The entire Yangtze River Economic Belt has a 2,838-kilometer-long main stream and a 71,000-kilometer-long basin, which undertakes 55% of China's domestic river transportation tasks. In the urban agglomeration in the middle reaches of the Yangtze River, it is necessary to handle the relationship between industrial structure adjustment and ecological protection. There are 400,000 chemical plants in the middle and lower reaches of the Yangtze River, and the total economic output of chemical industry accounts for more than half of China. China's steel bases and petrochemical bases are all arranged according to the Yangtze River Basin. The urban agglomeration in the lower reaches of the Yangtze River has grasped the key point of river-sea transport and connected the construction of an international shipping center with river-sea transport.

The rapid development of the Yangtze River Delta region has brought fiscal benefits to local governments, but in order to survive and develop, enterprises need to transfer production factors from high-cost areas to low-cost areas, which will affect local government fiscal revenue. In order to avoid the negative impact of enterprise mobility on finance and promote economic development at the same time, the governments of the Yangtze River Delta city cluster reached a consensus to promote the liberation of productivity by strengthening institutional cooperation and improving regional integrated production relations. Regional coordination has evolved from roads and highways to bridges and high-speed railways, achieving the integration of transportation and economic development and laying the foundation for the layout, factors and institutional cooperation of the city cluster.

7. Challenges and future directions

In recent years, China has vigorously promoted coordinated regional development and achieved remarkable results. First of all, the characteristics and advantages of each region have been fully utilized, and the development speed and efficiency have been significantly improved. Secondly, the infrastructure, investment and financing environment and policy environment in various regions have been significantly improved, and the foundation for coordinated regional development has been gradually established. In addition, the leading role of key regions and important economic zones has been enhanced, and the degree of regional cooperation and integration has been significantly improved. Finally, the economic growth of underdeveloped areas has accelerated, the vitality and initiative of development have increased, and the momentum of widening development gaps between regions has slowed down.

However, China’s regional economic development faces many challenges, which come from both domestic and internal factors as well as the international and external environment.

Internally, these mainly include: the gap in economic and social development between regions is still too large and continues to expand; low-level competition and disorderly development are serious; the distribution of national productivity is unreasonable; inter-regional interest relationships are not straightened out, and there is a lack of scientific and standardized institutional structure. To adjust the interest relationships in resource development, ecological protection and the flow of production factors, the market mechanism is insufficient; the management system and legal system to promote coordinated regional development are imperfect. These problems indicate that the situation of uncoordinated regional development in China has not fundamentally changed.

With the deepening of reform, opening up and modernization, China’s coordinated regional development is facing new challenges. First of all, due to physical geography

and historical differences, backward regions are unable to share the benefits of globalization and technological progress, and resources and factors flow out, resulting in the "Matthew Effect". Secondly, there is still a "scissor gap" in the price of production factors between urban and rural areas, especially the "siphon effect" in big cities. The phenomenon of using rural resources at low prices to support urban development is not conducive to the coordinated development of urban and rural areas. Third, the accelerated development of backward areas requires resource and environmental support, but they face resource and environmental bottlenecks and sustainable development issues. Fourth, the political system and market system are imperfect. Some local governments and enterprises avoid macro-control and purely pursue economic growth, which leads to the weakening of the effectiveness of macro-control policies and hinders coordinated regional development.

The current international situation has undergone major changes and adjustments that have been rare for many years, showing the outstanding characteristics of increased uncertainty, intensified mutual influence, and accelerated spread. Specifically, it is manifested in the rise of anti-globalization, geopolitical tensions, and the slowdown of the world economy, significant inflation, etc. These changes in the international situation have brought serious challenges to China's economic development, which are mainly reflected in the increasing difficulty of ensuring stable economic growth, the increasing difficulties of maintaining stable growth of foreign trade, the increasing obstacles to the actual use of foreign capital and the introduction of technology, and the implementation of effective macroeconomics. The influencing factors of policies are increasing.

(1) The rise of anti-globalization

The first decade of the 20th century was a period of accelerated globalization. The world economy grew at an average annual rate of 4.0%, and the global poverty rate dropped from 29.3% in 2000 to 16.3% in 2010. Globalization promotes the flow of resources and capital to high-profit areas. Developing countries have developed

rapidly due to low labor and resource costs, and developed countries have also developed through the export of capital and technology. However, this broke the pattern of developed countries dominating the world economy. In recent years, some developed countries, led by the United States, have used political and economic means to hinder the global flow of resources, capital and technology out of their own interests and challenge globalization. For example, the United States' suppression of Huawei and its crackdown on Tiktok.

(2) Geopolitical tensions

Geopolitical tensions are a hot topic in international relations, especially in recent years. The Russia-Ukraine conflict that broke out on February 16, 2022, the Palestinian-Israeli conflict in the Middle East, and the Israel-Lebanon conflict epitomize this tense situation. There are also geopolitical tensions over China's Taiwan Strait issue. Geopolitical tensions have a major impact on the world's economy, politics and military, not only in the regions involved, but also across the globe. The Russia-Ukraine conflict caused the economies of Russia and Ukraine to decline by 2.1% and 29.1% respectively, in contrast to the global economic growth of 3.4%. With Russia the world's second-largest producer of oil and natural gas and Ukraine a major producer of agricultural products, the conflict has led to higher international commodity prices and supply chain disruptions or adjustments. The future development and impact of the Russia-Ukraine conflict are still unclear, as is the situation in the Middle East.

(3) World economy slows down

In recent years, affected by changes in the international situation and the COVID-19 epidemic, world economic growth has slowed down. In 2020, the global economy declined by 3.0%. Although it rebounded to 6.0% in 2021 after countries adopted unconventional quantitative easing policies, this growth was based on a rebound from a low base. Economic growth will drop to 3.4% in 2022, and the IMF predicts it will slow further to 2.8% in 2023. Overall, the recovery of the world economy is still fragile, with average growth of 1.4% in 2020-2021 and 2.1% in 2020-2022, which is

significantly lower than the average annual growth rate of 3.7% in 2010-2019 before the epidemic.

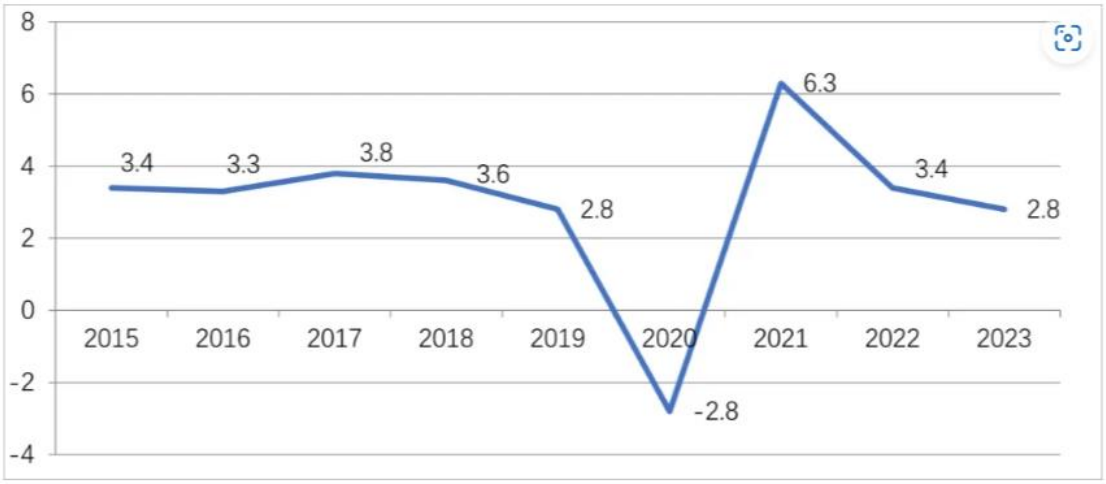

Figure 23: 2015-2023 World Economic growth rate (%)

In the face of the economic downturn caused by the COVID-19 epidemic, various countries have adopted loose macroeconomic policies, which mainly include increasing money supply and lowering interest rates. At the same time, geopolitical tensions, especially the conflict between Russia and Ukraine, have led to instability in the supply of major commodities, and global inflation has risen sharply. Consumer prices will rise by 4.7% in 2021 and 8.7% in 2022, the highest increase since 1996. In response to serious inflation risks, countries have gradually abandoned loose policies and adopted tightening policies, especially continued increases in interest rates and reduced liquidity, resulting in a slowdown in price increases.

In the face of major adjustments and changes in the world situation, my country's foreign trade, actual use of foreign capital, technological exchanges and financial instruments, and even economic stability and recovery are facing increasingly difficult and severe challenges. The uncertainty of the international situation and the increasing mutual influence of various factors have brought greater pressure and difficulty to the stable recovery of China's economy.

Foreign trade is an important channel for China's economic exchanges with the world and plays an extremely important role in China's economic development. The fluctuations in the RMB exchange rate caused by the turmoil in the international

financial market have caused great disturbances to exports. Some countries have adopted measures such as “stuck” and “cut off”, and increased tariffs to restrict the export of some of my country’s products, increasing the number of exports. The difficulty of maintaining stable growth in trade.

Technological progress is the fundamental factor for sustained and stable economic growth, and the current stable recovery of the economy also depends on technological progress. Although China has made significant progress in technological innovation, it still relies on the introduction of technology in areas such as high-end equipment and chips. In order to curb China’s economic development, some countries have set up technical barriers and restricted technology exports, posing severe challenges to China’s introduction of advanced technologies.

Taking into account the above difficulties in domestic regional development and the severe challenges brought about by changes in the world situation, the key to China’s economic development is to adhere to promoting domestic economic development as the fundamental point and focus on promoting coordinated regional development.

The main direction is to use various effective means to promote the formation of a coordinated regional development pattern with clear main function positioning, positive interaction between the east, middle and west, full play to the comparative advantages of each region, harmonious relationship between man and nature, and narrowing the gap between basic public services and people’s living standards.

8. Conclusion

This article takes a comprehensive look at China’s regional economic development pattern, paying particular attention to the continuing challenges of regional disparities and the pursuit of convergence. Through Krugman’s core-periphery theory, China’s core and peripheral areas were identified and the huge differences between coastal and inland areas were revealed. The analysis highlights the importance of scale effects, industrial chains, spillover effects and labor agglomeration in shaping regional economies.

In addition, the article also analyzes the policy shifts and historical evolution of China’s regional economic development, examines its effectiveness in resolving regional differences, and specifically analyzes the four major strategies China is implementing for coordinated regional economic development. Through empirical analysis, the adaptability of China’s industrial policy is clarified and its responsiveness to geopolitical dynamics is demonstrated.

The article also emphasizes the breakthroughs and innovative explorations in China’s industrial policies, especially those in surrounding areas, highlighting the resilience and adaptability of the Chinese economy. This adaptive capacity, coupled with strategic government intervention, bodes well for future prospects for regional integration and balanced development.

The study found that: (1) China's regional economic differences show the characteristics of cyclical fluctuations in time. In space, they are mainly centered on the eastern coastal provinces and cities, with the central and western inland areas as the periphery. (2) Differences between regions are the main reason for regional economic disparity. (3) Regional economy has a radiating effect. (4) Upgrading of industrial structure, government intervention, improving transportation facilities and improving education are the main ways to effectively reduce regional differences.

According to the conclusions of this article, the implications are as follows: First, in order to narrow the development gap between regions, different methods need to be

adopted according to local conditions for developed coastal areas and inland areas; second, under the current unstable situation, on the one hand, to ensure the economic results of the eastern coast, on the other hand, in order to break through the situation of the eastern coast being surrounded by Japan, South Korea and other countries, the development of the inland central and western regions and cooperation with inland bordering countries are particularly important.

Overall, this study contributes to the academic discussion of regional economic development by consolidating important insights into regional differences and convergence in China. It highlights the importance of balanced regional development in sustaining national prosperity and provides valuable insights into strategies to achieve this goal.

As China continues to navigate global economic uncertainty and geopolitical complexity, the study's findings serve as a reminder of the need to prioritize inclusive growth and equitable development across regions. By adopting Krugman's core-periphery principles and improving its industrial policy, China can chart a path toward a more cohesive and resilient economic landscape that will ensure prosperity for years to come.

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GDP	Gross national product
NEG	New Economic Geography
CPC	Communist Party of China
BTH	Beijing-Tianjin-Hebei

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Andrew, Simon A., and Richard C. Feiock. “Core–Peripheral Structure and Regional Governance: Implications of Paul Krugman’s New Economic Geography for Public Administration.” *Public Administration Review* 70, no. 3 (2010): 494–99.

Baldwin, Richard E, and Rikard Forslid. “The Core–Periphery Model and Endogenous Growth: Stabilizing and Destabilizing Integration.” *Economica* 67, no. 267 (2000): 307–24. https://doi.org/10.1111/1468-0335.00211.

“From Recovery to Rebalancing,” n.d.

Fujita, Masahisa, and Paul Krugman. “The New Economic Geography: Past, Present and the Future.” In *Fifty Years of Regional Science*, edited by Raymond J. G. M. Florax and David A. Plane, 139–64. Berlin, Heidelberg: Springer, 2004. https://doi.org/10.1007/978-3-662-07223-3_6.

Fujita, Masahisa, Paul R. Krugman, and Anthony Venables. *The Spatial Economy: Cities, Regions, and International Trade*. MIT Press, 2001.

Fujita, Masahisa, and Tomoya Mori. “Frontiers of the New Economic Geography.” In *Papers in Regional Science*, 84:377–405, 2005. https://doi.org/10.1111/j.1435-5957.2005.00021.x.

Fujita, Masahisa, and Jacques-François Thisse. “Economics of Agglomeration.” *Journal of the Japanese and International Economies* 10, no. 4 (December 1, 1996): 339–78. https://doi.org/10.1006/jjie.1996.0021.

Giulio Buciuni and Giancarlo Corò. *Periferie competitive*. il Mulino, n.d.

Huang, Yukon. “Reinterpreting China’s Success Through the New Economic Geography,” n.d.

Krugman, P. “What’s New about the New Economic Geography?” *Oxford Review of Economic Policy* 14, no. 2 (June 1, 1998): 7–17. https://doi.org/10.1093/oxrep/14.2.7.

Krugman, Paul. *Geography and Trade*. MIT Press, 1992.

———. “Increasing Returns and Economic Geography,” 2024.

———. “The New Economic Geography, Now Middle-Aged.” *Regional Studies* 45, no. 1 (January 1, 2011): 1–7. https://doi.org/10.1080/00343404.2011.537127.

Krugman, Paul. “Increasing Returns, Monopolistic Competition, and International Trade.” *Journal of International Economics* 9, no. 4 (November 1, 1979): 469–79. https://doi.org/10.1016/0022-1996(79)90017-5.

Milanovic, Branko. “China’s Inequality Will Lead It to a Stark Choice,” n.d.

Paul Krugman. “Trade, Accumulation, and Uneven Development,” n.d.

Rodríguez-Pose, Andrés. “The Revenge of the Places That Don’t Matter (and What to Do about It).” *Cambridge Journal of Regions, Economy and Society* 11, no. 1 (March 10, 2018): 189–209. https://doi.org/10.1093/cjres/rsx024.

Venables, Anthony J. “Equilibrium Locations of Vertically Linked Industries.” *International Economic Review* 37, no. 2 (1996): 341–59. https://doi.org/10.2307/2527327.

"Which Way Forward? Navigating China's Post-Pandemic Growth Path," n.d.

Xu Shengxia, Liu Qiang, and Feng Liang "The spatiotemporal evolution characteristics and causes of regional economic gaps in China," n.d. (2023)

Wang Qi. "The evolution of regional economic disparities in China" n.d. (2023)