An Approach to the Spatial Pattern of Regional Innovation Development Based on Later-Advantages

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Abstract: It is critically significant to realize later-advantages in underdeveloped region by regional innovation development modes. Taking Guangxi as case area, this study analyzes the favorable conditions and practical obstacles to the realization of late-developing advantages. Then, by AHP and FA analysis, this study proposes the policies of Guangxi late-developing advantages from three aspects, including innovative industrialization strategy, innovative society construction strategy, and regional innovation spatial organization strategy, based on its late-comer advantages. These strategy and policy recommendations seek to explore innovative development ideas and regulations that could be helpful specifically to the western region through Guangxi development path research.

1 Introduction

The idea of late-comer advantages originated from the international division of labor, comparative production cost theory and dynamic comparison cost theory in comparative advantage theory [1-3]. The concept of late-comer comes from Muller's investigation of the economic development of different countries [1]. The formal use of late-comer advantages as economic terminology and theorization of this idea are Geschenkron and Levi [2, 3]. Since that, many scholars have been conducting relevant empirical researches on the advantages of late-comers. Aiken [4] established a general equilibrium model of technology transfer, imitation and innovation under open economic conditions, emphasizing the convergence of economic development between North and South countries, that is, economically underdeveloped countries can imitate, introduce or innovate technology to realize the late-advantages, and to ultimately achieve the catch-up of technical and economic levels. Krugman [5] proposed the frog leap model of technological development, which laid a theoretical foundation for the leaps and bounds of the late-developing countries, and surpassed the starting countries in terms of technology and economy. It also showed the economy development has both continuity, accumulation, jumping and replacement, further explaining the phenomenon of unbalanced paths in economic development [1].

Some domestic researchers analyzed the conditions for realizing the late-advantages, where some necessary conditions are summarized [6], such as, there is a stable institutional structure and policy environment; there is a favorable external environment; and the necessary infrastructure. And the first driving force hypothesis of the government was put forward, and the initial economic development may lack some initial conditions and face obstacles to economic start-up [6, 7]. At this point, the government can make the most important efforts to promote the formation of initial conditions.

Regional differences are the core of regional economic research. Regional coordinated development based on the improvement of the overall economic efficiency of the country requires

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that underdeveloped regions must maximize the regional post-development advantage to economy catching up [8]. However, as of now, the researches on late-comer advantages have not formed a complete and rigorous theoretical system. Different theoretical views involving late-comer advantages have not been unified to establish an internal logical connection within a theoretical framework [7]. In addition, the theory of late-comer advantage is limited to the scope of discussion at the national level, but there is still little research on the internal level of a country. In the past, most of the theory of late-comer advantage is only to analyze the concept, content, performance and realization conditions of the late-coming advantages, lack of corresponding implementation mechanism research, and lack of relevant strategic guidance, especially the current comprehensive analysis of the theory of late-advantages under the knowledge economy [5, 6]. For this reason, it is difficult to give effective guidance to regional development in the context of economic knowledge and informationization. At present, the innovation model has been transformed into a system network innovation model, emphasizing the role of tacit knowledge, innovation activities and economic operations are increasingly socially rooted and geographically rooted [6]. All these could pose a challenge to the traditional late-comer advantage theory and empirical study.

2 Methodology

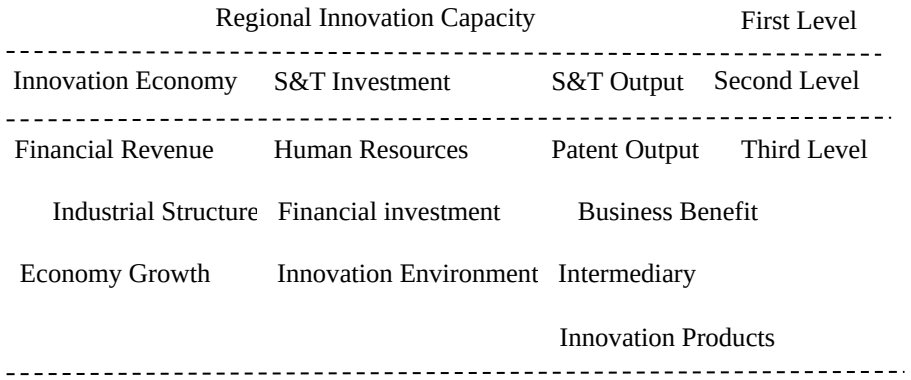

Fig 1. Index system on regional innovation ability based on later-advantages

The study of urban innovation evaluation system is still scanty in the whole innovation system research. At present, there is no systematic and unified overall evaluation standard for the construction of the indicator system. First, according to the development situation of Guangxi Economy, based on the framework of urban innovation evaluation system [9], combined with the innovation capability index system and evaluation system constructed by China Science and Technology Development Strategy Research Group in China Regional Innovation Development Capacity Report (Figure 1). Then, using the FA (factor analysis) and AHP (analytic hierarchy process) methods, according to the data from Guangxi Statistical Yearbooks, the study analyzes the regional innovation ability of various cities in Guangxi.

The basic idea of the analytic hierarchy process is to level the problems to be analyzed, according to the nature of the problem and the overall goal to be achieved, the problem is decomposed into different components, and according to the related influences of these factors and their affiliation, the factors form a multi-level analytical structure model. Finally, the problems are compared and ranked.

Factor analysis refers to a multivariate statistical analysis method that combines some information overlapping and intricate relationships into a few unrelated comprehensive factors from

the dependence relationship within the correlation matrix of research indicators. The basic idea is to group the variables according to the size of the correlation, so that the correlation between the variables in the same group is higher, but the variables of different groups are not related, and each group represents a basic structure, that is, a common factor. The procedure is as follows, (1) Standardize the data samples. (2) Calculate the correlation matrix of the sample. (3) Find the eigenvalues and eigenvectors of the correlation matrix. (4) Determine the number of principal factors according to the cumulative contribution rate required by the system. (5) Calculate the factor load matrix. (6) Determine the factor model. (7) Analyze the system based on the above calculation results.

3 Results

Table 1 Ranking the urban innovation ability

Area	Ranking	Classification	Area	Ranking	Classification
Nanning	1	1	Guigang	8	3
Guilin	2	2	Fangchenggang	9	3
Liuzhou	3	2	Hezhou	10	3
Beihai	4	3	Laibin	11	4
Qinzhou	5	3	Baise	12	4
Yulin	6	3	Hechi	13	4
Wuzhou	7	3	-	-	-

The empirical study shows that Nanning has the highest innovation ability, far surpassing other cities, followed by Guilin and Liuzhou along the Xiang-Gui Railway. Laibin, Baise and Hechi are in the last three places for the innovation ability assessment. Overall, the status of innovation capacity of cities is basically the same as that of urban economic development.

3.1 Urban innovation system construction

The urban system in Guangxi need still be improved. There is no mega-city in the economic geography sense, and there is a shortage of big cities, and there is no medium-sized city as a local economic center. Moreover, the current economic center in Guangxi is still dominated by agglomeration process, and the radiation effect on the hinterland region, especially for the vast rural economy, is very limited, and the dual structure is prominent [10]. Even if the innovation ability is much higher than that of other cities, the role of the central city of Nanning is not obvious. To a large extent, it is still concentrated, and the radiation effect is weak. The cultivation of central cities with strong radiation diffusion is the primary link of Guangxi's spatial development strategy. The strategic focus is to cultivate the central cities of Nanning, Guilin and Liuzhou, focus on the development of the above three urban innovation systems, and implement a knowledge layout, especially the basic research layout should be based on the main central cities. Develop three sub-central city innovation systems in Beihai, Qinzhou and Wuzhou, pay attention to cultivating sub-center and basic innovation capabilities, with emphasis on cultivating the ability to absorb and transforming knowledge. At the same time, it gradually expands around several central cities, moderately expands the cultivation and development of industrial technology capabilities to lower-level cities and rural areas, and strengthens the regional innovation diffusion effects.

3.2 Innovation development point axis space organization strategy

In the future, efforts should be made to build three regional innovation development axes. (1) Gui-Liu-Nan Central Axis. From Quanzhou in the north to Pingxiang in the south, Nanning, Guilin and Liuzhou, the three largest central cities in Guangxi, and the cities of Laibin and Chongzuo, and 10 counties are included. The development zone of this axis has the strongest innovation capability and is the primary key axis in the future and the main source of regional innovation diffusion. (2) Xijiang axis. Xijiang has an actual navigation capacity of about 800 kilometers in Guangxi. It is from Nanning in the west and to the west Guangdong. It is the golden waterway in Guangxi. The axis belts are distributed in Nanning, Guigang, Wuzhou and Yulin cities. In the future, the level of knowledge within the Pan-Pearl River Delta Zone should be strengthened to accelerate the pace of industrial transfer. (3) Nan-Bei-Qin-Fang North Bay axis. It is located at the southwestern tip of China's coastal area and is composed of administrative areas under the four cities of Nanning, Beihai, Qinzhou and Fangchenggang. In the future, it should strengthen the construction of the China-ASEAN regional information exchange center, build the China-ASEAN technical achievements exhibition and trading platform, build the China-ASEAN modern agricultural science and technology training base, cultivate innovative talents, and strengthen ASEAN's knowledge production, knowledge collaboration and knowledge innovation, to vigorously enhance the ability of regional innovation [10].

3.3 Special zone innovation development strategy

Special types of districts have developing difficulties only relying on their own resources, and regional innovations are more like castles in the air. Governments at all levels need to attach great importance to and support them [9]. (1) At present, there are 6 revolutionary old districts and counties, 80 ethnic autonomous counties, 6 land border counties and 38 poverty-stricken counties in Guangxi. Due to natural conditions, location and historical basis, these areas have become the poorest areas in the district. The strategic thinking is: to strengthen science and technology poverty alleviation work, strengthen scientific popularization work; strengthen education, especially nine-year compulsory education, vigorously carry out continuing education and vocational education, to improve the quality of workers, and raise people's awareness of knowledge economy. (2) The degradation of ecosystems in karst forms in Guangxi is serious, especially soil erosion has intensified desertification. Such areas are weak in science and technology resources, and scientific research institutions that research ecology are particularly lacking, and these areas need to rely heavily on the government. Government should focus on the construction of science and technology demonstration parks such as returning farmland to forests and ecological reconstruction, developing special ecological industries and advantageous non-agricultural industries, innovating circular economy models, and raising the overall innovation awareness of the public.

3.4 Construction of regional innovation environment

(1) In terms of institutional environment, government must first correct the guiding ideology of regional development, focus on cultivating flexible specialized production systems, and develop special industries based on locality characteristics. The regional innovation development strategy should become the guiding ideology of regional development. It is necessary to fully recognize the primacy of regional learning, imitation innovation and secondary innovation. Otherwise, independent innovation can only be a castle in the air. Government need improve the legal system related to innovation. Special attention is paid to perfecting the property rights system, recognizing the common property rights, giving certain managers and R&D personnel a certain shareholding to

the benefit of the enterprise and sharing the risks. Establish and improve the social credit system, and strive to establish a complete set of credit inquiry and reward and punishment systems. Establish and improve the innovative service system, promote the socialization and industrialization of innovative service organizations, establish a flow mechanism of technology, knowledge and talents, construct a sound regional innovation value chain, and accelerate the transfer, use and diffusion of technological achievements.

(2) Strive to create a fair competitive market environment and allow all types of production factors to circulate freely. We will intensify the reform of the financial system and vigorously develop the risk investment mechanism, and we can try the government credit guarantee bank loans for SMEs. Vigorously cultivate the technology information market.

(3) Strengthen the construction of innovative infrastructure. At present, the tangible innovation infrastructure is still in short supply. An important manifestation is that the allocation of public libraries and public laboratories is seriously inadequate. In addition, the construction of labor training and continuing education is lagging behind, and the pace of building various innovative infrastructures must be accelerated.

4 Conclusion

China has paid attention to the spatial structure of regional development, which is of significance in the National Five-Year Plan. The main regional innovation planning work is being vigorously implemented, and land planning and regional planning work are widely carried out at different regional levels. The development and construction of Guangxi should implement the key development strategy of “point-line-belt”, which is also the overall strategy of the national western development plan. Specifically, there are three basic aspects. First, Guangxi should take full use of the national-level functional planning and deployment system. According to the existing development density, future development potential, and resource and environmental carrying capacity of the entire space, the planning of the region should be first to improve regional innovation. This study focuses on the development of key development zones in four main functional areas. Second, Guangxi's regional innovation development should take the central city as the main support point for development, focus on the development of three economic axes, and accelerate the pace of regional innovation system construction. Third, government need attach importance to development and support for the poor areas, rural areas and ecological functional areas.

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