RESEARCH ARTICLE

EMPIRICAL RESEARCH ON REGIONAL INNOVATION MODE IN CHINA

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ABSTRACT

The similarity of regional innovation strategy in China leads to similarity innovation environment and results, hinder the flow of innovation elements and results. In this paper, we use multidimensional scaling to analysis the regional innovation based on the data of 2012, find that the particular position of Beijing and Shanghai, causing the innovation is different with other provinces, while Zhejiang, Jiangsu, Shandong and Guangdong with the coastal location advantage and economic support innovation mode is similar to with each other; others are taking the imitative innovation and absorption.

INTRODUCTION

On November 8, 2012, the eighteenth National Congress of the Communist Party of China was held, put forward the implementation strategy of innovation driven development, and emphasizes that scientific and technological innovation is the strategic support to improve the social productive forces and the comprehensive national strength, promote the reform of china. On November 9, 2013, the Third Plenary Session of Eighteen National Congress of Communist Party of China was held, the president of china put the science and technology innovation to new height again, we're keen to grasp the development trend of world science and technology, the implementation of driving the development of innovative strategies, promoting industrial transformation and economic transformation.

30 years of reform and opening door policy, scientific and technological innovation puts massive effects on Chinese tremendous economic development. At present, Chinese technology development entered a period of important jump. The R & D funds of the whole society in 2012 get more than 1 trillion Yuan for the first time, China's R D personnel total reached 3200000 person years, ranking first in the world; the number of SCI (Science Citation Index) in Chinese scientific and technical papers gained rapid growth and

ranked second in last four years in the world; the invention patents reached 217000, ranked the third in the world; China technology contract transactions the average annual growth of more than 20%, reaching 640 billion Yuan. The added value of 105 high-techs Zone accounted for 14.5% of the country in 2012.

We can see that the scientific and technological innovation plays an indispensable role in promoting China's economic development and the improvement of the comprehensive national strength, but the regional innovation in China has a similar composition to a certain extent, so that the industry development and layout of the similarity between different regions, resulting in homogeneous competition, irrational allocation of resources, brought some resistance to the development of the country and regional economy. Therefore, this paper will use DNA to analyze regional innovation similarity in China, provide guidance on the direction of development of regional innovation in the future.

The similarity between individual in biology relies on the DNA. We will also study of Chinese regional innovation from the angle of DNA in this paper. The paper is organized as follows: section 1 does some analysis on the innovation of DNA; section 2 puts forward the innovation of DNA in Chinese context; section 3 analysis of regional innovation similarity,

put forward the region on the basis of the decision-making and the future direction of development; section 4points out the limitation and future research directions.

INOVATION DNA

The double helix structure of DNA proposed by Watson (J. D. Watson) and Crick (F. Crick), because the DNA can store a large amount of genetic information in 1953, so it can be used to describe the individual biological characteristics, distinguish the similarity. Later, some scholars believe that the organizational behavior of individuals with different DNA has different behaviors and characteristics, do the research on innovative DNA can be useful, and that genes can produce two results: temperament and personality, allowing people to adapt and change, innovation genes can consciously into organizational culture and change employee behavior, and then promote the development of the organization.

Professor Ruth Ann Hattori and Joyce Wycoff in Innovation University (IU) analysis of the lucent company and proposes the DNA model based on organization innovation in 2002, points out that innovation is in a certain organizational context and in the operating channel, which including the scene can see the future leadership (Leadership), to promote the core the value of innovation (core value) and can provide the soil of the innovation culture(Culture); innovation channel is thought, change, passion, power flow, they are innovation driving factors, provides incentive method organization out of the status quo.

Santa Vaithilingm and Dr. Mahendhiran Nair published an article entitled "the key driving factors in developing countries banking" at the Journal of Global Business and Technology in 2006, pointed out that the infrastructure, innovation ability, the institution and the government are key factors in the development of the banking industry (DNA). Professor C. Broke Dobni in University of Saskatoon Saskatchewan argued that innovative organization needs robust workers and good empowerment culture in 2008, he defined the DNA sequence as knowledge management DNA, cluster management DNA, value management DNA and alliance DNA(Dobni, 2008).

In 2013, professor Clayton M. Christensen in Harvard business school and Jeff Dyer, the Professor of economics at the Brigham Young University and professor Hal Gregersen in INSEAD write in collaboration with each other with a book named "innovators gene" in lasted eight years, the main part of innovation of DNA content are: (1) the DNA of disruptive innovators refers to ask questions, communication and contact, experiment and observation skills, provides a method of self-identification, test their innovative DNA; (2) the genes of destructive innovation company including personnel, procedures and objectives.

In summary, we can see the previous studies on innovation DNA focused on the organizational level, only Dr. Santha Vaithilingm and Professor Mahendhiran Nair do the research on regional innovation DNA. As the macro environment is different in different country, different development history and resource endowments, there are differences of driving factors of innovation ability between China and Malaysia, China inevitably exists regional innovation of DNA itself, the analysis of regional innovative DNA has very important guiding significance to china regional innovation strategy.

DNA OF REGIONAL INNOVATION IN CHINA

After decades of development，China regional innovation get its own characteristics and diversity and differences. Innovation ability determines the competitiveness of a country. From the analysis of the factors of national competitiveness on the global competitiveness report, the world economic forum will divided the evaluation index into infrastructure, promote innovation and innovation; Lausanne International Institute for Management Development developed the evaluation indicators into economic performance, government efficiency, business efficiency and infrastructure; the indicators of United Nations Industrial Development Organization is composed of natural, economic, social, political and technical; the development strategy group of China technology focus on knowledge creation,

knowledge acquisition, enterprise innovation, innovation environment and innovation performance. Integration of these documents and Chinese unique characteristics, we put Chinese characteristics of regional innovation into 6 "I" model (DNA): Infrastructure, intellectual capital, institutions, interaction, Integrity and Incentive.

DNA indicators		Description
The basic factors	Infrastructure	Mainly refers to the macro infrastructure
The driving factors	intellectual capital	Knowledge assets
	Institution	Innovation actor
	Interaction	information flow and knowledge sharing
	Integrity	health, public service management
	Incentive	Financial and non-financial support

Infrastructure mainly refers to the traffic infrastructure, communications and other public infrastructure. Infrastructure is a prerequisite for the development of regional innovation ability. The infrastructure of innovation is the condition of innovation ability development, also is an indicator to evaluate regional innovation ability(Caerteling, Di Benedetto, Doree, Halman, & Song, 2011). Innovation environment construction should be compatible with the R&D funds, the fund investment benefit maximization, increasing influence of urbanization on regional innovation, reducing the obstacles of knowledge communication between areas, to increase mutual exchanges, promote mutual interaction and the ability of regional innovation.

Knowledge capital is the interactive relationship between innovation actors. Technology innovation input, R & D investment are important factors, knowledge creation capability and the ability of knowledge acquisition are one face of regional innovation ability(Acha, Marsili, & Nelson, 2004). The market will adjust to the knowledge spillover through institutional arrangements, but the long-term development needs to rely on knowledge assets accumulated, including Explicit and Tacit knowledge(Agarwal, Echambadi, Franco, & Sarkar, 2004).

Institutions mainly refer to the innovation actor, these actors are an important part of national or regional innovation system, the only difference is that the role of these actors in region area(Coriat & Weinstein, 2002). Interactive communication refers to interacting between the internal or regional innovation actors, such as government, enterprise, University and scientific research institution. The technology transfer and interaction mechanism between research and development is a key problem of regional innovation, regional and inter regional innovation activities(Bernardes & Albuquerque, 2003). Capital flow is hindered, it will hinder the technology spillover, and leads to innovation activities are limited in a few regions, which make the innovation ability of the expanding gap(Martin, 2012). Integration refers to the integration of various elements, realizes the best configuration, and also is the good governance in innovation activities. Local government is very important for the strength of promoting the country's innovation. The local government should play an active role in promoting the construction of the regional innovation system, the construction of center city and metropolitan region, regional three levels of regional innovation systems(Chesbrough, 2003).

Incentive mainly includes fiscal and non-fiscal support. Each regional market degree has an obvious role in improving the innovation ability, only actively promote the market, play the guiding role of government and market promotion effect are the keys to improve the regional innovation capability (Aksen, Aras, & Karaarslan, 2009; Ballesteros & Rico, 2001).

EMPIRICAL ANALYSES
Index Selection:

Table 1: Index description

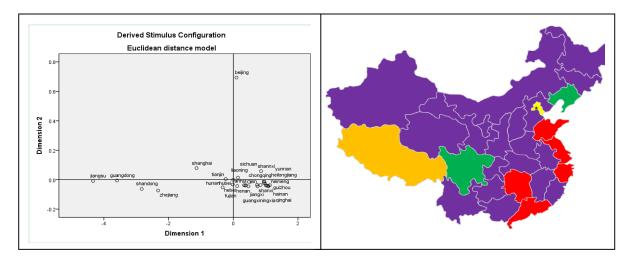| Infrastructure	Traffic line length and the total population
Intellectual capital	Industrial Enterprises above Designated, patents, new product output value
Institution	The number of full-time teachers in colleges and universities, the number of high schools
Interaction	Technology turnover and new product revenue
Integrity	The people in Public Library, the number of medical institutions, the number of community service institutions
Incentive	R&D funds, local fiscal education expenditure and GDP

Empirical Analysis:

Our data from China Statistical Bureau website data in 2014, first, we will use descriptive statistics, the results are listed in the following table:

Table 2: Descriptive Statistics

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Rail_lenth/s	30	25.72	778.21	231.11	191.96
popu	30	573.17	10594	4482.70	2721.45
RD per	30	2020.3	424563.2	74870.04	99505.21
Patent	30	844	472656	62846.63	98022.171
Col_tea	30	6668	163592	75029.57	41866.040
col_NO_	30	9	153	81.20	37.911
Tech_tur	30	5666.14	24585034	1947031.74	4478487.84
Newp_sales	30	103772.80	178454192	36842556.95	46739788.21
lib_per	30	1010	64180	14347.33	14062.686
med_ins	30	4140	79119	31454.57	21302.949
publ_ser	30	70	37399	6670.80	8757.058
RD_exp	30	78092.80	10803107	2400037.94	2944352.36
edu_fund	30	1147143.8	13592334.0	5647513.357	2948347.04
GDP	30	1893.54	57067.92	19195.03	14173.83
Valid N	30				

From the above descriptive statistics analysis we can see all the provinces are the effective sample analysis. On the whole, China's regional innovation between regions get larger gap, such as a university, Qinghai is the lowest only 9 universities, and most of the 153 in Jiangsu, the university is also a regional indispensable innovation main body, therefore, the regional gap will inevitably result in the innovation ability.

We use multidimensional scaling to analytic similarity in DNA. We find that 0.0048 is the size of stress, and the Stress and squared correlation (RSQ) is 0.99996. Because stress is the smaller the better, RSQ is the bigger the better. We can be sure that the data can be fitted better and graphics. And then the following results:

From the above chart, because of the unique political status, policy advantage and scientific and technological strength, Beijing is different with other provinces. For the future policy guidance of the Beijing is to make full use of their own political advantage and Zhongguancun high-tech Park, attracting the advantages resources together, forming a unique innovation environment, maintain a sustained innovation;

Shanghai is the economic center in China, we can see the similarity with other provinces of Shanghai higher than in Beijing, but also escape from the surrounding community, the reason is that economic position in Shanghai that Shanghai can attract more easily innovation capital;

Although Shanghai's economic status is prominent, but there are challenges from Jiangsu, Guangdong, Shandong and Zhejiang, high innovation similarity in these four provinces, they are in the coastal and eastern regions, with developed economy, location advantages are obvious, promote innovation by economic growth from investment in science and technology, the future development direction of the four provinces are using their own economic strength and location advantages, strengthen cooperation

with Shanghai and sharing resources , get a strong innovation agglomeration effect;

Other provinces are relatively similar, all are the central and western regions, especially innovation mode in the western provinces just introduces and absorb. For central provinces, such as Sichuan, with military industry, is unique. The future policy of these provinces is focus on economic development pattern and the experience from Jiangsu and Zhejiang to drive innovation. The western provinces focus on the introduction of advanced technology mainly from Beijing, Shanghai and Zhejiang, then absorbs it.

FUTURE RESEARCH DIRECTIONS

In this paper, we use of the existing literature analysis the similarity of Regional Innovation in China based on multidimensional scaling analysis, has a guiding significance for establishing regional open innovation. However, the analysis only focuses on one year; the dynamic change of regional similarity is lost. Future research can analyze the similarity of specific changes in the last three or five years, finding the path of innovation difference, make it suitable for the policy service.

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