Chapter 11
Research on Innovation Capability of National High-tech Zones: Model Building and Empirical Analysis

Jiangfu Zhang and Xin Gu

Abstract The paper builds a theoretic innovative model of national high-tech zones according to the characteristics of regional innovation system. Based on the regional panel data of 56 national high-tech zones in 2011, the author analyses their innovation abilities through the way of principal component analysis. The results show that the innovation ability of the national high-tech zone is mainly embodied in the three principal component factors and the input of scientific and technical personnel and funds, technology innovation activities, innovation efficiency. Besides, the innovation ability of utility value, which are the three principal component factors of 56 national high-tech zones possess, is not consistent. In addition, the input of scientific and technical personnel and funds is closely related to innovation ability of high-tech zones. Lastly, the innovation ability of the national high-tech zones still has a "high in the East, medium in the Middle Part, low in the West" pattern.

Keywords National high-tech zones · Regional innovation system · Innovation ability · Principal component analysis

11.1 Introduction

Since 1991, China has successively established 56 national high tech Industrial Development Zone (calls it NHTZ for short). NHTZ has become Technology Industrial Park to gather resources for innovation and promote the development of high

J. Zhang (✉)
Business School, Sichuan University, Chengdu 610064, People's Republic of China
e-mail: 253088397@qq.com

J. Zhang
Law and Social Sciences, Mianyang Normal University, Mianyang 621000,
People's Republic of China

X. Gu
Innovation and Entrepreneurship Research Institute,
Sichuan University, Chengdu 610064, People's Republic of China

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tech industry, which makes an important contribution in promoting local and national economic development. According to statistics: China's identified high-tech enterprises has soared from around 2,587 in 1991 to 51,764 in 2011, and employment growth from 12 to 859 million. Profits increased from 8 billion yuan to 6,261 billion yuan, the corporate tax increase from 39 billion yuan to 4,968 billion yuan, export growth from 1.8 to 2,476 billion. In the past 20 years, China's growth rate of the main economic indicators of NHTZ is more than 70 %, NHTZ plays an important role in promoting the regional innovation capacity. The research on innovation ability of NHTZ belongs to the RIS category, through summarizing the research of regional innovation capacity at home and abroad, it's mainly reflected in four aspects: First, research on the factors influencing regional innovation capability, OECD focuses on R&D investment contribution to the role of regional innovation capability. Based on this evidence, Zhu province believes that cannot ignore the role of non R&D investment, its effect is significant to the region innovation ability [11]; Second, construct the index system of regional innovation capability, to build up a set of suitable for comprehensive evaluation of regional innovation ability index, Liu established five indicators to comprehensive evaluate Regional Innovation Capability according to the situation of Chinese, including: knowledge creation capability, knowledge flow capability, enterprise innovation capability, innovation environment, innovation economic performance and some small index to evaluate Chinese provinces of regional innovation capability [7]. Third, the evaluation method of regional innovation ability, including quantitative methods such as AHP, DEA [5], and Malmquist index [10], and qualitative evaluation methods that focus on Innovation performance participatory, non-economic indicators about the body in the innovation process and innovation performance affect each other [8]. Fourth, the comparative study of regional innovation capability. Sun use the "Provinces" for regional unit, has evaluated regional innovation capacity in different provinces of China [9]. Foreign scholars Asheim and Coenen has make a comparative analysis of Norway's three regional industrial clusters [2]. Cooke comes to a conclusion that different regions have different innovation mode, through a comparative study on the America Massachusetts and Cambridge two regional high-tech biotechnology industry [4]. Based on the opinion of scholars on the basis of summarizing, the author raised three issues:

- First, as the high-tech industry gathering area, whether the NHTZ constitute the regional innovation system, namely, whether the NHTZ meets the basic conditions for regional innovation systems?
- Second, each region has its different regional innovation model, how to select the high-tech zones to reflect the index system innovation capability?
- Third, there's a number of regional innovation capability evaluation methods, how to select the appropriate evaluation methods to evaluate the NHTZ innovation capability?

These problems are the paper aims to solve.

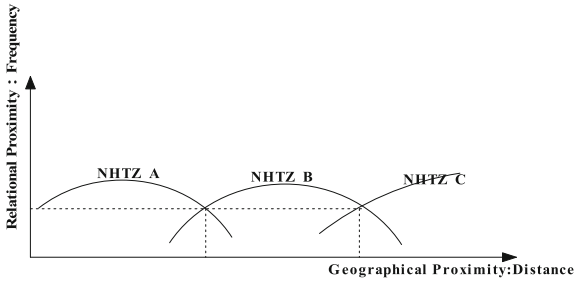

Fig. 11.1 Relational proximity and geographical proximity of NHTZ

11.2 NHTZ Innovation Capability Model

In the regional innovation system, the word "region" has two aspects meaning: First, the geographical boundaries of the region, such as the division of administrative regions; Second, the functional region, such as the formation of a target based on cooperation, trust and other relations [6]. Geographical boundaries pay attention to the knowledge transfer and spillover advantage of regional proximity. The functional region put forward the the proximity of relationship is conducive to the formation of innovation ability. But both can promote effective the formation of regional innovation capability, and the NHTZ reflect the organic combination of geographical and functional region (as shown in Fig. 11.1).

Innovation System can be divided into three levels: (1) National Innovation System (NIS), (2) Regional Innovation System, (3) Sectional Innovation System (SIS) [1]. NHTZ belongs to the regional innovation system level, is a place of high-tech industry cluster, the high-tech industry cluster is associated with each other (complementary and competing) in the high-tech in the field of enterprises and institutions gather in a certain region, to form an upper, middle and lower structurally-complete, and peripheral supporting industrial system and creative energy organic system. Within this space gathering system, innovation subject (enterprises, institutions, service organizations at NHTZ) through multilateral trading learning, communication activities, in order to agglomeration and the formation of innovation network interaction as a link, promote multilateral inter subjective knowledge dissemination and diffusion, interdisciplinary and industrial integration, the formation of innovation ability of NHTZ.

Therefore, the basic conditions of NHTZ with the regional innovation system is:

1. There are subjects with innovation ability, including the University and Research Institute, the core enterprise, government, intermediary service institutions and financial organization.
2. Based on the flow of innovative factors, the regional innovation subjects form all the relationships, such as cooperation, competition and trust relationship.
3. Supported regional innovation infrastructure, system and social environment, such as transportation, education and research infrastructure, policy system and innovative culture atmosphere.

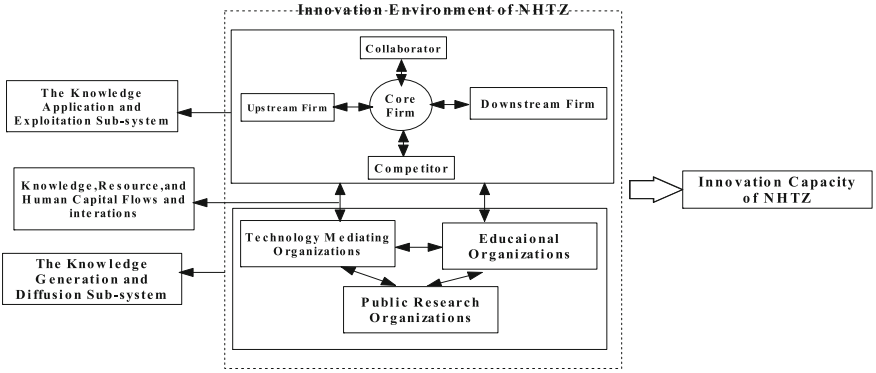

Fig. 11.2 An empirical analysis of the NHTZ innovation capability

And the innovation system of NHTZ can be divided into two subsystems, including knowledge application and development, knowledge production and diffusion [3]. The sub system of knowledge application and development is mainly composed of regional innovation of enterprises, in particular to vertical industry chain (the core enterprise, related upstream and downstream enterprises) and lateral chain (core business partners and competitors). Innovation capacity is forming at Enterprise-centric crisscrossing network; The subsystem of knowledge production and diffusion is mainly constituted by universities, research institutes and agencies. Knowledge is mainly produced in public organizations (such as research organizations, educational institutions), diffusion and spread through intermediaries, labor intermediaries and other supported innovation regional institutions. The two subsystems are not independent division, there is a flow of human capital, capital, and knowledge of innovative elements, with the support of regional innovation environment together constitute the NHTZs innovation system, each element interacts with the ability to influence the formation of innovative NHTZ. Therefore, in this article, the NHTZ is defined as: In order to improve the innovation capacity in the region, take the high-tech industry cluster in the region as the basis, and maximize the synergy of each subjective innovation, optimizing the configuration area resources (such as personnel, capital and knowledge, etc.), aimed at improving the innovation ability of NHTZ innovation systems through innovative activities, specifically as shown in Fig. 11.2.

11.3 Evaluation Index

Based on the innovation capability of high-tech zone model of the article, the connotation of the innovation capability of NTHZ is that, in order to promote the local and national economic growth, the NTHZ (such as Baotou Rare-Earth Hi-tech Zone, Zhangjiang Hi-tech Zone) is the basic unit of regional Innovation, the University,

Table 11.1 List of variables and summary statistics

First-grade index	Second-grade index	Unit	Abbreviation
Innovation	Numbers of enterprises	Hundred	Ne
Capacity index	Employee	Ten thousand	Ep
	Science and technology personnel ratio	Percentage	St
	Senior professional titles ratio	Percentage	Sp
	Junior college and above ratio	Percentage	Jc
	Per capita assets	RMB one hundred million /person	Ca
	Science and technology activity expenses within budget	RMB one hundred million	Sa
	Science and technology activity expenses outside spending	RMB one hundred million	Sc
	RD expenses within budget	RMB one hundred million	Rd
	Total industrial output value	RMB one hundred million	Ti
	Industrial added value	RMB one hundred million	Ia
	Per capita net income	RMB ten thousand/person	Cn
	Pay tax ratio	Percentage	Tr
	Export ratio	Percentage	Er
	Debt	RMB one hundred million	Db
	Technical income ratio	Percentage	Te
	Product sales ratio	Percentage	Ps
	Commodity sales ratio	Percentage	Cs
	Gross trading income	RMB one hundred million	Gt

scientific research institutions, intermediary service institutions, enterprises and government innovation subject integrated, and play a synergistic efficacy between innovation subject resources, optimize the allocation of resources within the region so that the knowledge, information can transform to new products, new technology and the capability of new services. So the evaluation of innovation capability of NTHZ should grasp three principles: First, cooperative principle, innovation is not only produced in a single organization or institution, but also includes the coordination of regional innovation between organizations; Secondly, efficiency Principle, innovation capability should reach resource optimization and form the target of Input and output efficiency. Thirdly, commercial principles, the mere technological knowledge does not constitute the innovation capability, innovation capability is the knowledge, technology and information into new products, new technology and new energy services.

According to NTHZs innovation systems, capabilities and principles, the paper pre-selected key indicators of innovation capability (see Table 11.1).

In order to ensure the reliability and validity of measurements, the paper adopts the Delphi method and the variation coefficient method to test the theoretical construct indicators of reliability and validity.

Firstly, use the Delphi method to test theory indicators reliability, the specific steps are as follows:

1. According to the index system of theoretical constructing, take the 7-point Likert scale developed questionnaire consulting table;
2. Selection of experts, from the 56 CMC of NHTZ, and enterprises, research institutes, universities and other institutions were randomly selected 180 experts as questionnaire investigation. they have been long engaged in the regional innovation ability of high-tech zone of the practice and theoretical research, has a wealth of knowledge and experience;
3. Fill in the questionnaire consulting tables through the mail, on-site investigation to experts.
4. Recovery of the questionnaire. The effective recovery of the questionnaire is 159, the recovery rate is 88.33 %.
5. Collation, analysis of the questionnaire. Suppose the index i in the x_i, the j expert selection score is B_{ij}, that the total score A in the index for x_j for 159 experts is: $A = B_{i1} + B_{i2} + \cdots + B_{i159} = \sum_{j=1}^{159} B_{ij}$.

The reliability A_i of index x_i is: $A_i = \sum_{j=1}^{159} B_{ij}/1113$.

If A_i approaches 1, index x_i has high reliability in the evaluation of NHTZ supported innovation-driven development, namely at the 7-point scale, most experts select the very important options; Conversely, when A_i close to 0, the index is not important, when $A_i \leq 0.4$, shows that at the 7-point scale, most experts select the unimportant options, the reliability of the index x_i is low, it can be deleted. And, use Coefficient of variation ($C.A$) to delete the index that can't be distinguished the difference in index system to test validity, the formula is: $C.V_i = S_i/\overline{\Omega_i}$, where, Ω_i is the Observations of the index x_i. When the characteristic value $C.V_i$ is greater, that the discrete data of index x_i is high, the difference of index data is very obvious, can reflect the differences in the degree of innovation-driven development, and has high validity; Instead, when $C.V_i$ reaching to 0, the index x_i has low validity.

Finally, According to the Delphi method and the coefficient of variation, we selected the observed datas of 56 NHTZs in 2011 to calculate the characteristic value A_i and $C.V_i$ of each index, to test its reliability and validity, as specified in Table 11.2.

According to index of reliability and validity testing table, the paper select the number of enterprises (Ne), number of employees (Ep), scientific and technical activities staff ratio (St), the senior staff ratio (Sp), science and technology activities Intramural Expenditures (Sa), R&D Intramural Expenditure (Rd), industrial added value (Ia), per capita net income (Cn), pay tax ratio (Tr), exports ratio (Er), technology-income ratio (Te), total revenue (Gt) and other indicators to evaluate the innovation capability of NHTZ.

Table 11.2 List of variables and summary statistics

Index	A_i	$C.V_i$	Index	A_i	$C.V_i$
Ne	0.69	2.29	Ep	0.75	1.03
St	0.74	0.44	Sp	0.68	0.52
Jc	0.73	0.28	Ca	0.55	0.38
Sa	0.77	1.40	Sc	0.29	–
Rd	0.67	1.28	Ti	0.33	–
Ia	0.57	0.64	Cn	0.79	0.55
Tr	0.83	0.51	Er	0.44	1.25
Db	0.22	–	Te	0.76	1.26
Ps	0.62	0.16	Cs	0.26	–
Gt	0.88	1.26			

11.4 Data and Model

The paper selected evaluating indexs of statistical panel data in 2011 from 56 NHTZs to analyze, data mainly from the "China high-tech industry Yearbook in 2011", "China hi-tech industry development zone Yearbook In 2011", and "China Torch statistical Yearbook in 2011" and other categories of NHTZ statistical Yearbook. Using principal component model (PCA) to evaluate the innovation capability, which has two advantages: First, it can avoid subjectivity empowerment, Usually, empowerment weight is very subjective, which can affect the validity of evaluation results; Second, Remove the correlation of multivariable. The correlation of multiple variables will lead to repeated use of data, that the evaluation results is difficult to reflect the true situation of evaluation objects.

The research objects has a total of $n(56)$ samples, each sample select $p(12)$ variables to evaluate innovation capability, and constitute a $n \times p$ data matrix:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1p} \\ x_{21} & x_{22} & \cdots & x_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{np} \end{bmatrix}, \quad (n = 56,\ p = 12)\,. \tag{11.1}$$

Because the variable p is more, this paper used synthesis variable Z instead of the original variable p to reflect the information, make $x_1, x_2, \cdots, x_{12}$ for the original variables, $z_1, z_2, \cdots, z_m$ as new variables, change the original variable X in Eq. (11.1) into new variable Z:

$$Z = \begin{cases} z_1 = l_{11}x_1 + l_{12}x_2 + \cdots + l_{1p}x_p \\ z_2 = l_{21}x_1 + l_{22}x_2 + \cdots + l_{2p}x_p \\ \quad \vdots \\ z_m = l_{m1}x_1 + l_{m2}x_2 + \cdots + l_{mp}x_p \end{cases} \quad (m \le 12,\ p = 12)\,. \tag{11.2}$$

In the Eq. (11.2), the new variables $z_1, z_2, \cdots, z_m$, are known as the components of first, second or m of the original variables $x_1, x_2, \cdots, x_p$.

First, r_{ij} $(i, j = 1, 2, \cdots, 12)$ is the correlation coefficient of original variables x_i and x_j, according to Eq. (11.1), calculate the correlation coefficient matrix of the p-original variables.

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1p} \\ r_{21} & r_{22} & \cdots & r_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ r_{p1} & r_{p2} & \cdots & r_{pp} \end{bmatrix} (p = 12). \tag{11.3}$$

Secondly, according to Eqs. (11.2) and (11.3), the solution of the characteristic equation to calculate the eigen values, the principal component contribution rate Φ_i and cumulative contribution rate Φ:

$$\Phi_i = \frac{\lambda_i}{\sum_{k=1}^{12} \lambda_k} \ (i = 1, 2, \cdots, 12). \tag{11.4}$$

According to Eq. (11.4), it can calculate the cumulative contribution rate of its principal components before i:

$$\Phi = \Phi_1 + \Phi_2 + \cdots + \Phi_i = \frac{\sum_{k=1}^{i} \lambda_k}{\sum_{k=1}^{12} \lambda_k} \ (i = 1, 2, \cdots, 12). \tag{11.5}$$

Finally, take the contribution rate of each principal component as weighting factor, change each index value into the standard value, and calculate the value of the evaluation and comprehensive evaluation value of principal component:

$$F_i = e_{i1} zx_1 + e_{i2} zx_2 + \cdots + e_{ij} zx_j (i, j = 1, 2, \cdots, 12), \tag{11.6}$$

$$F = \frac{\lambda_1}{\sum_{i=1}^{12} \lambda_i} * F_1 + \frac{\lambda_2}{\sum_{i=1}^{12} \lambda_i} * F_2 + \cdots + \frac{\lambda_i}{\sum_{i=1}^{12} \lambda_i} * F_i. \tag{11.7}$$

In Eq. (11.6), e_{ij} is the principal component load, zx_j is the standardized values for the variables x_j, and the innovation capability of NHTZ can be evaluated by using Eqs. (11.6) and (11.7).

11.5 The Empirical Results Analysis

The PCA model is complex in calculation, this paper use SPSS17.0 software to evaluate the innovation capability of the 56-NHTZ from the following three aspects: Descriptive statistics of innovation variables, influencing factors of regional innovation capability, and the innovation capability ranking.

Table 11.3 List of variables and summary statistics

	Ne	Ep	St	Sp	Sa	Rd	Ia	Cn	Tr	Er	Te	Gt
Ne	1	0.94	0.27	0.10	0.88	0.87	0.48	0.16	−0.14	−0.08	0.35	0.93
Ep		1	0.35	0.03	0.95	0.94	0.69	0.19	−0.22	0.02	0.36	0.97
St			1	0.33	0.48	0.49	0.52	0.28	−0.05	−0.21	0.29	0.40
Sp				1	0.11	0.12	0.19	0.15	0.07	−0.24	0.21	0.09
Sa					1	0.98	0.71	0.31	−0.18	−0.06	0.33	0.96
Rd						1	0.69	0.26	−0.18	−0.05	0.41	0.94
Ia							1	0.44	−0.22	0.00	0.25	0.69
Cn								1	−0.35	−0.30	0.11	0.35
Tr									1	−0.16	−0.14	−0.20
Er										1	−0.20	−0.04
Te											1	0.32
Gt												1

11.5.1 Descriptive Statistics of Innovation Variables

The descriptive statistics of NHTZ-12 indicators is be normalized, and into the correlation coefficient matrix, get the correlation coefficient matrix between indexs (see Table 11.3). The Table 11.3 shows, the number of variable enterprises (Ne), and the the number of employees (Ep), science and technology activities Intramural Expenditures (Sa), R&D Intramural Expenditure (Rd), and total revenue (Gt) was significant correlation. The number of employees (Ep), technology activities Intramural Expenditures (Sa), R&D Intramural Expenditure (Rd), total revenue (Gt) were significant correlation. The variables of science and technology activities Intramural Expenditures (Sa), R&D Intramural Expenditure (Rd) and total revenue (Gt) were significant correlation. R&D Intramural Expenditure (Rd) and total revenue (Gt) were significantly correlated.

11.5.2 Principal Component Factor Analysis of Innovation Capability

Equations (11.4) and (11.5) calculate the principal components corresponding contribution rate and cumulative contribution rate (see Table 11.4). According to the two principles of PCA model, (1) varimax rotation method, (2) eigen values was greater than 1, and the extraction of the principal component. From Table 11.4, the Variance contribution rate of the first principal component was 48.78 %, the second variance contribution rate was 18.47 %, the third was 15.41 %, the cumulative variance contribution rate was 82.66 %, the three main components that can be used to explain the original 12 evaluation indexes about 80 % of the variance, so we just calculate the three principal component z_1, z_2, z_3 to evaluate the innovation capability of NHTZ.

Table 11.4 List of variables and summary statistics

Principal component	λ_i	$\Phi_i(\%)$	$\Phi_i(\%)$
Z_1	5.85	48.78	48.78
Z_2	1.62	18.47	67.25
Z_3	1.25	15.41	82.66
Z_4	0.88	5.32	87.98
Z_5	0.87	4.28	92.26
Z_6	0.64	3.32	95.58
Z_7	0.44	1.71	97.29
Z_8	0.30	1.53	98.82
Z_9	0.10	0.83	99.65
Z_{10}	0.02	0.17	99.83
Z_{11}	0.01	0.12	99.94
Z_{12}	0.01	0.06	100.00

Table 11.5 List of variables and summary statistics

	z_1	z_2	z_3
x_1	0.88	−0.21	0.22
x_2	0.95	−0.26	0.10
x_3	0.14	0.88	0.01
x_4	0.19	0.66	0.18
x_5	0.97	−0.11	0.07
x_6	0.96	−0.11	0.11
x_7	−0.21	0.10	0.77
x_8	0.39	0.42	−0.64
x_9	−0.26	0.14	0.80
x_{10}	−0.11	0.29	−0.16
x_{11}	0.45	−0.71	0.13
x_{12}	0.05	−0.16	0.97

About the extracted three principal components for the corresponding eigenvalues, by using the Eq. (11.6) to calculate the load of variables $x_1, x_2, \cdots, x_{12}$ on the principal component z_1, z_2, z_3 (Table 11.5). The first principal component z_1 was significantly stronger positive correlation with indicators Ne, Ep, Sa, Rd, which is a comprehensive reflection of the staff and investment funding of NHTZ. The second Principal component z_2 has a stronger positive correlation with indicators St, Sp, but has significantly stronger negative correlation with Te. St, Sp, Te reflects technology innovation activities of the NHTZ, The third principal component index z_3 has a strong positive correlation with Ia, Tr, Gt,but a strong negative correlation with the index Cn, Ia, Cn, Tr, Gt reflects the output efficiency of the NHTZ, and the principal component z_3 represents innovative output efficiency of NHTZ.

Table 11.6 List of variables and summary statistics

NHTZ	$\hat{F}_1$	Ranking	$\hat{F}_2$	Ranking	$\hat{F}_3$	Ranking	$\hat{F}$	Ranking
Beijing	100	1	10	55	74	4	100	1
Shanghai	46	2	50	20	21	55	43	2
Wuhan	35	3	51	17	55	18	35	3
Xian	34	5	62	6	55	19	34	4
Guangzhou	34	4	25	52	47	30	30	5
Shenzhen	31	7	56	11	42	34	30	6
Chengdu	32	6	46	29	42	36	30	7
Hangzhou	28	8	10	54	56	17	24	8
Tianjin	27	9	29	49	37	49	23	9
Zhengzhou	22	14	71	4	47	29	22	10
Nanjing	22	12	62	7	33	52	21	11
Changchun	24	10	73	2	0	56	20	12
Dalian	23	11	37	42	49	26	20	13
Shijiazhuang	18	18	72	3	50	25	18	14
Wuxi	22	13	39	36	28	53	18	15
Zhongshan	15	26	100	1	48	28	17	16
Changsha	19	15	52	15	41	38	17	17
Shenyang	19	17	38	39	49	27	16	18
Jinan	19	16	29	50	54	20	16	19
Zibo	16	21	48	25	69	7	16	20
Hefei	15	25	52	16	70	6	16	21
Weifang	17	20	70	5	25	54	15	22
Taiyuan	14	29	50	18	74	3	14	23
Qingdao	16	23	61	8	40	40	14	24
Suzhou	17	19	34	44	39	43	13	25
Baotou	13	32	53	13	53	22	12	26
Haerbing	13	34	50	21	60	11	12	27
Foshan	16	22	39	38	37	48	12	28
Nanchang	9	46	57	10	90	2	12	29
Anshan	14	27	46	28	45	32	12	30
Xiangfan	14	31	39	37	57	15	12	31
Jilin	12	38	44	30	71	5	11	32
Changzhou	15	24	35	43	38	46	11	33
Baoji	12	39	50	19	56	16	11	34
Daqing	12	36	43	34	58	14	11	35
Luoyang	13	35	43	33	51	24	10	36
BaoDing	12	37	57	9	34	51	10	37
Nanning	14	30	20	53	52	23	9	38
Zhuhai	14	28	31	45	39	45	9	39
Zhuzhou	10	44	47	27	58	13	9	40
Weihai	11	41	53	14	39	42	9	41
Kunming	11	42	54	12	39	44	8	42
Xiangtan	9	47	49	23	63	9	8	43

(continued)

Table 11.6 (continued)

NHTZ	$\hat{F}_1$	Ranking	$\hat{F}_2$	Ranking	$\hat{F}_3$	Ranking	$\hat{F}$	Ranking
Xiamen	10	43	48	26	41	39	8	44
Fuzhou	10	45	50	22	44	33	7	45
Ningbo	11	40	31	46	36	50	7	46
Chongqing	13	33	0	56	45	31	7	47
Lanzhou	8	49	43	32	62	10	6	48
Mianyang	8	48	30	48	54	21	4	49
Guilin	6	52	37	41	60	12	4	50
Taizhou	7	50	42	35	42	37	4	51
Wulumuqi	6	51	38	40	39	41	2	52
Yangling	0	56	49	24	100	1	2	53
Guiyang	5	54	25	51	67	8	2	54
Huizhou	6	53	44	31	37	47	2	55
Hainan	5	55	30	47	42	35	0	56

11.5.3 Innovation Capability Evaluation

Using Eqs. (11.6) and (11.7) to calculate principal component z_1, z_2, z_3 corresponding F_1, F_2, F_3 evaluation value and comprehensive evaluation value F. For comparison analysis, we take the evaluation value F_1, F_2, F_3, F to be normalized, the formula is:

$$\hat{F} = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}}. \tag{11.8}$$

$\hat{F}$ is the evaluation value of F_1, F_2, F_3, F after ormalization, Its value in the range [0, 100], $x_{\min}$ and $x_{\max}$ is the minimum and maximum of F_1, F_2, F_3 evaluation value, respectively.Using formula (11.8) for F_1, F_2, F_3, F original evaluation, get the innovation capability evaluation value table of NHTZ (see Table 11.6).

11.6 Conclusions and Recommendations

This paper theoretically builds the innovation system mode of NHTZ, and then further through an empirical analysis of the influence principal component factor of innovation capacity of NHTZ, evaluation of each principal component factor of the innovation capability of the utility value and comprehensive innovation capability, thus providing a theoretical basis for the scientific judgment of the policy effect. Results and conclusion is embodied in the following aspects.

First, the innovation capacity of NHTZ is mainly reflected in three aspects, that the scientific and technical personnel and founding, technology innovation and innovation output efficiency.

Second, in the three principal component of the scientific and technical personnel and funding, technological innovation and innovation output efficiency, scientific and technical personnel and funding has close relationship with the supported development of innovation-driven, which directly affects the regional innovation capability of ranking. Therefore, it should grasp the key aspects to increase the scientific and technical personnel and funding when evaluate the innovation capability.

Third, the three principal component of the evaluation values are not the same, and does not appear the same height with low convergence phenomenon. NHTZ like Beijing, Shanghai, Wuhan, Xi'an, Guangzhou has a higher points in the evaluation of personnel investment, NHTZ like Zhongshan, Changchun, Shijiazhuang, Zhengzhou and Weifang dominate in the evaluation of the technological innovation, Yangling, Nanchang, Taiyuan, Beijing and Jilin dominate in the evaluation of innovation output efficiency.Therefore, 56-NHTZ has its own characteristics, there is no uniform optimal development model, policy makers should recognize the advantages of the development of regional characteristics, local conditions suitable for various NHTZ to explore innovation-driven model of development.

Fourth, the pattern of NHTZ of regional innovation capability presents the characteristics of "Eastern high, Central medium, low in the Western." The innovation capability in eastern coastal areas is strong. Apart from the central region of Zhengzhou, innovation capability of other high-tech zones are all of sorts. The western Hi-tech Zones are weak except for Chengdu. Therefore, it's need for the eastern to maintain and play a leading role, and increase the technology personnel, funding and policy support to the Central and Western.

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