Study on Industrial Competitiveness of Henan Province Based on Spatial Expansion Model of Shift-share Method

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Abstract: Under the background of the New Development Concept raised in 19th Communist Party of China National Congress advocating high-quality development, optimizing industrial structure and enhancing industrial competitiveness are of key significance for Henan Province to transform economic growth momentum and promote healthy and sustainable economic development. The results of empirical analysis of industrial development in Henan Province based on spatial expansion model of Shift-share Method shows that, compared with the neighboring provinces, the structure of the primary industry with original comparative advantages in Henan Province is unreasonable, showing a trend of recession, while the secondary and tertiary industries with faster development lack significant competitiveness and are not stable. Therefore, the adjustment of the industrial structure of Henan Province should start with a clear direction of industrial development and optimization of industrial policies, focus on modern agriculture, encourage and guide agricultural products processing industry, and foster and support modern service industries, thereby enhancing industrial competitiveness.
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Key words: Industrial structure; Industrial competitiveness; Shift-share Method

As an important development province in the central and western regions, the sound development of Henan Province's economy is of key significance in responding to and supporting the country's *Rise of Central China* strategy. The New Development Concept raised in the 19th Communist Party of China National Congress advocates high-quality development of the economy, which not only puts forward higher requirements for Henan's industry about its standards and depth of structural optimization but also reflects the importance and urgency of accelerating the cultivation and upgrading of industrial competitiveness in Henan Province. This paper studies the industrial competitiveness of Henan Province and believes that it should make full use of the positive externalization brought about by regional economic development, foster support for modern agriculture and service industries, and encourage and guide agricultural product processing industry. All the measures can provide decision-making reference for enhancing the industrial competitiveness of Henan Province. Based on the empirical analysis, this paper systematically studies the overall situation of the three industrial competitiveness of Henan Province from a spatial perspective. Then considering spatial agglomeration and demonstration effects, this paper also provides theoretical support for the evaluation of industrial competitiveness of Henan Province.

The spatial expansion model of Shift-share Method was raised by scholars Nazara and Hewing who considered the interaction between regions on the basis of the traditional Shift-share Method. The model is mainly used in academic fields such as regional economy and employment. Akihiro Otsuka used the spatial expansion model of Shift-share Method to dynamically analyze the factors affecting Japan's energy demand fluctuations. Gian Pietro Zaccomer and Pamela Mason used the spatial expansion model of Shift-share Method to analyze the employment growth rate in Italy considering the relationship between industry portfolio and corporate legal status effects in their neighborhoods. Ding Hao and Wang Jiaming et al. used the Shift-share Method from the spatial perspective to study the competitiveness of industrial structure in Shandong Province.

1. Research Methods

For the study of industrial competitiveness, the methods commonly used in the academic world include factor analysis, principal component analysis, SWOT matrix analysis, Diamond Model and Shift-share Method. Compared with other methods, the traditional Shift-share Method has the advantages of simple and easy in technology and fast and accurate in analysis, which is scientific and applicable to study the industrial competitiveness of Henan Province in reality. The innovation of this paper is to further use the spatial expansion model of Shift-share Method for empirical analysis. Considering the regional industrial development is affected by the national, regional and internal efficiency, the externalization of the spatial industrial clusters such as agglomeration effect and demonstration effect are covered in the content, which

can increase the objectivity and comprehensiveness of the conclusions of this study.

According to the spatial expansion model of Shift-share Method, the basic components include the national growth component, the proximity-rationale growth component, and the proximity-efficiency component. The specific indicators and calculation process are as follows:

$$W_{rk}=\frac{1/|X_r-X_k|}{\sum 1/|X_r-X_k|} \quad (1)$$

The spatial interaction intensity coefficient was proposed by scholar Boamet in 1998, where Wrk refers to the spatial interaction intensity coefficient, r is Henan Province, and k is the neighboring four provinces. X means the per capita GDP, therefore Xr represents the per capita GDP of Henan Province, and Xk represents the per capita GDP of the four neighboring provinces.

$$SGR_i=\left(\frac{\sum W_{rk}^0 * E_{ik}^1}{\sum W_{rk}^0 * E_{ik}^0}-1\right)*100\% \quad (2)$$

Where: SGRi is the industrial spatial growth rate. Wrk is the spatial interaction intensity coefficient. E is the total sales value. And i means the industry. During a specific research period, 0 is the base period, and 1 represents the final period. The meaning of SGRi is the growth rate of the total sales value of the i industry in Henan Province in the entire region.

$$NS_{ir}=\frac{E_{ir}^0}{E_r^0}\left(\frac{E_n^1}{E_n^0}-1\right)*100\ \% \quad (3)$$

Where: NSir represents the national growth component, and n means the whole country. $\frac{E_{ir}^0}{E_r^0}$ refers to the proportion of sales value of the i industry in Henan Province in the base period. $\left(\frac{E_n^1}{E_n^0}-1\right)=\frac{E_n^1-E_n^0}{E_n^0}$ means the growth rate of the total sales value of all industries in the national industry. Correspondingly, the meaning of NSir is the component which needs to calculate the multiplication of the proportion of sales value of the i industry in Henan Province and the national industrial growth rate. NSir>0 indicates that the i industry in Henan Province is the growth sector, and NSir<0 means it is the recession sector.

$$N\text{-}MIX_{ir}=\frac{E_{ir}^0}{E_r^0}\left(\frac{\sum W_{rk}^0 * E_{ik}^1}{\sum W_{rk}^0 * E_{ik}^0}-\frac{E_n^1}{E_n^0}\right)*100\% \quad (4)$$

Where: N-MIXir is the proximity-rationale growth component. $\left(\frac{\sum W_{rk}^0 * E_{ik}^1}{\sum W_{rk}^0 * E_{ik}^0}-\frac{E_n^1}{E_n^0}\right)=\left(\frac{\sum W_{rk}^0 * E_{ik}^1}{\sum W_{rk}^0 * E_{ik}^0}-1\right)-\left(\frac{E_n^1}{E_n^0}-1\right)$ is understood as that the national industrial growth rates subtracted from the spatial growth rate. Correspondingly, the meaning of N-MIXir is the component which needs to calculate the multiplication of the proportion of sales value of the i industry in Henan Province and the above subtract result. N-MIXir>0 indicates that the neighboring provinces have a positive external effect on the competitiveness of the i industry in Henan Province, N-MIXir<0 means they will have a negative impact.

$$N\text{-}DIF_{ir}=\frac{E_{ir}^0}{E_r^0}\left(\frac{E_{ir}^1}{E_{ir}^0}-\frac{\sum W_{rk}^0 * E_{ik}^1}{\sum W_{rk}^0 * E_{ik}^0}\right)*100\% \quad (5)$$

Where: N-DIFir is the proximity-efficiency component. $\left(\frac{E_{ir}^1}{E_{ir}^0}-\frac{\sum W_{rk}^0 * E_{ik}^1}{\sum W_{rk}^0 * E_{ik}^0}\right)=\left(\frac{E_{ir}^1}{E_{ir}^0}-1\right)-\left(\frac{\sum W_{rk}^0 * E_{ik}^1}{\sum W_{rk}^0 * E_{ik}^0}-1\right)$ is understood as that the spatial growth rate is subtracted from the growth rate of i industry in Henan Province. Correspondingly, the meaning of N-DIFir is the component which needs to calculate the multiplication of the proportion of sales value of the i industry in Henan Province and the above subtract result. N-DIFir>0 indicates that the i industry in Henan Province makes full use of the positive impact brought by regional economic development, can better cope with external competition threats, and has strong competitiveness. N-DIFir<0 is on the opposite.

$$N_{ir}=NS_{ir}+N\text{-}MIX_{ir}+N\text{-}DIF_{ir} \quad (6)$$

Where: Nir means the actual growth which is the sum of the three components.

$$N\text{-}MD_{ir}=N\text{-}MIX_{ir}+N\text{-}DIF_{ir} \quad (7)$$

Where: N-MDir means the total deviation which is the sum of the proximity-rationale growth component and the proximity-efficiency component.

On this basis, the Shift-share analysis chart can be further drawn, including the department advantage analysis chart and the department deviation component analysis chart. The former can initially judge whether

the industrial sector grows and clear its relative advantages and disadvantages, while the latter can analyze the basis maturity of the industrial sector and the intensity of its competitiveness. The specific drawing method is as follows: the coordinate system where the horizontal and vertical axes are represented by different indexes is equally divided into eight parts by two 45° bisectors, which are sequentially recorded as Si (i=1, 2...., 8), respectively. Each quadrant corresponds to different index evaluation results about industrial advantages, foundations and competitiveness. The calculation results are substituted into the chart and draw dot. Then combined with the distribution，the advantages and disadvantages of the industrial structure of the study area and the contribution of different components can be analyzed. From this, the development status of relevant industries can be judged and preliminary predictions can be made for their future development trends. The evaluation system is shown in Tables 1 and 2.

Table 1 Evaluation system of department advantage analysis chart

Department Grade	Quadrant	Evaluation results
Better	S1、S2	Have departmental advantage and grow
General	S3、S4	Have departmental advantage but decline；lack of departmental advantage but grow
Poor	S5、S6	Rither have departmental advantage or grow，but cann't eliminate the negative effects。
Worst	S7、S8	lack of departmental advantage and decline

Table 2 Evaluation system of department deviation component analysis chart

Good industry foundation	Poor industry foundation	Strong competitiveness	Insufficient competitiveness
S1、S2、S4、S5	S3、S6、S7、S8	S1、S2、S3、S6	S4、S5、S7、S8

2Empirical Analysis of Industrial Competitiveness in Henan Province

2.1 Research intervals and data sources

According to the spatial expansion model of Shift-share Method, this paper choose country and the geographically neighboring Shandong Province, Hubei Province, Anhui Province and Shanxi Province as reference to start the research on the industrial competitiveness of Henan Province. The time range is from 2005 to 2016. The data source is *China Statistical Yearbook* from 2006 to 2017.

2.2 Calculation results

Taking 2016 as an example, the per capita GDP of Henan Province and neighboring four provinces will be brought into the calculation formula of the spatial interaction intensity coefficient. The result is shown in Table 3. From this, the spatial interaction intensity coefficient of the other years is calculated and substituted into the formula for calculating the industrial spatial growth rate. The industrial spatial growth rate from 2005 to 2016 is shown in Table 4. Further, combined with other required data, according to the specific calculation formulas of the indicators required for the spatial expansion model of Shift-share Method, the calculation results of all components of the three industries in Henan Province from 2005 to 2016 are shown in Table 5.

Table 3. The spatial interaction intensity coefficient in 2016

Index	Henan	Shandong	Hebei	Anhui	Shanxi
X （yuan）	42575	67706	55038.40	39091.81	35532
W_{ik}^{12}	——	0.072	0.146	0.523	0.259

Table 4. The industrial spatial growth rate from 2005 to 2016

Year	Primary Industry	Secondary Industry	Tertiary Industry
2005	0.928	0.364	0.769
2006	0.089	0.173	0.188
2007	0.072	0.228	0.149
2008	0.091	0.234	0.092
2009	-0.206	0.012	0.001
2010	0.325	0.350	0.241
2011	0.224	0.270	0.191
2012	0.000	0.042	0.090
2013	-0.200	-0.085	-0.019
2014	0.316	0.143	0.257
2015	0.196	0.075	0.255
2016	0.144	0.127	0.186

Table 5. Analysis table of the spatial expansion model of Shift-share Method from 2005 to 2016 (Unit: %)

		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	均值
Primary Industry	N_{ir}	2.06	0.21	2.30	2.91	0.56	2.47	0.99	0.91	0.94	0.56	0.14	0.19	1.19
	NS_{ir}	2.74	2.59	3.34	2.64	1.29	2.53	2.36	1.30	1.25	0.97	0.73	0.90	1.89
	N-MIXir	13.42	-1.25	-2.30	-1.32	-4.15	1.95	0.50	-1.30	-3.72	2.79	1.49	0.63	0.56
	N-DIFir	-14.1	-1.13	1.26	1.59	3.42	-2.02	-1.86	0.91	3.41	-3.21	-2.09	-1.33	-1.26
	N-MDir	-0.69	-2.38	-1.04	0.27	-0.73	-0.06	-1.37	-0.39	-0.32	-0.41	-0.60	-0.70	-0.70
Second-ary Industry	N_{ir}	16.14	11.5	12.2	13.13	3.60	10.9	8.65	3.84	2.76	3.27	0.27	3.61	7.49
	NS_{ir}	8.16	9.23	12.6	10.19	5.10	10.2	10.17	5.61	5.28	4.17	3.12	4.04	7.32
	N-MIXir	10.68	0.08	-0.18	2.86	-4.41	9.24	4.68	-3.34	-9.71	3.13	0.49	2.00	1.29
	N-DIFir	-2.69	2.17	-0.17	0.08	2.91	-8.56	-6.20	1.58	7.19	-4.03	-3.33	-2.42	-1.12
	N-MDir	7.99	2.25	-0.35	2.94	-1.50	0.68	-1.52	-1.76	-2.52	-0.90	-2.85	-0.42	0.17
Tertiary Industry	N_{ir}	9.55	4.69	5.92	4.31	3.45	5.37	4.26	3.95	2.73	6.32	8.18	6.45	5.43
	NS_{ir}	4.84	5.31	7.23	5.41	2.87	5.61	5.93	3.53	3.62	3.04	2.59	3.54	4.46
	N-MIXir	18.81	0.51	-2.58	-2.69	-2.85	1.77	0.19	-0.49	-4.29	6.49	7.68	4.24	2.23
	N-DIFir	-2.69	2.17	-0.17	0.08	2.91	-8.56	-6.20	1.58	7.19	-4.03	-3.33	-2.42	-1.12
	N-MDir	4.71	-0.62	-1.32	-1.10	0.57	-0.25	-1.67	0.42	-0.89	3.28	5.59	2.91	0.97

2.3 Analysis of results

It can be seen from Table 2-3 that the average growth rate of the primary industry in Henan Province from 2005 to 2016 is 1.19%, which is lower than the national growth component of 1.89%. The actual growth value and national growth component of each year are positive, but the total deviation is negative in all other years except 2008, indicating that although the first industry in Henan Province belongs to the growth sector, it is lower than the country average level. Overall, the actual growth of the primary industry reached its maximum in 2010, before 2010 showing clear volatility and instability, while after 2010 showing a downward trend. Specifically, the proximity-rationale growth component was mostly negative in previous years and reached a minimum in 2013. Later it has risen to a positive value but has a significant downward trend. It eventually stabilized at a level of 0.56% of the mean. This indicates that the negative externalization of industrial space agglomeration are obvious, and the drag effect of neighboring provinces on the development of Henan's primary industry has been long-term and significant. In terms of proximity-efficiency component, it shows stage variation which can be described as a gradual increase from 2005 to 2009 then a fluctuating decline and the other period of growth from 2010 to 2016. In recent years, the values are mostly negative, reflecting the fact that compared with the neighboring provinces, the growth rate of the first industry in Henan Province is low and the competitiveness is gradually weakening.

The average growth rate of the secondary industry in Henan Province from 2005 to 2016 was 7.49%, which was higher than the national growth component of 7.32%. The average of total deviation was 0.17%, which fully reflected the secondary industry as the growth department of Henan Province for many years, whose development has considerable strength. However, it is slightly higher than the national level which means its growth potential needs to be further explored. Overall, compared with the relative stability of the national growth component, the maximum value of actual growth after 2005 appeared in 2010, before 2011 fluctuating above the mean level, while after 2011 fluctuating below the mean level. After the hard development in 2015, the actual growth of the secondary industry in 2016 achieved a certain recovery, but it was still below the average. Specifically, the proximity-rationale growth component has fluctuations from 2006 to 2011, but they are mostly positive values, indicating that during this time period, the structural advantages of the secondary industry in neighboring provinces are prominent and the driving effect on Henan Province is large. After reaching a minimum value of -9.71% in 2013, there has been a slow increase. This shows that in recent years, the development advantages of the secondary industry in the neighboring provinces is in decline, which has a negative impact on Henan Province. This bad influence has increased year by year, but favorable factors has appeared. The proximity-efficiency component varies from decline slightly to remaining steady, then from falling sharply to rising drastically，later to dropping slowly. Positive value reappeared in 2013 and reached its maximum for many years, reflecting the positive factors that contributed to the improvement of competitiveness appeared. But it's not universal and representative, also means there was large uncertainty. In addition, the contribution of the proximity-efficiency component to the total deviation gradually increases, which indirectly indicates that the secondary industry in Henan Province has a greater competitive disadvantage than the neighboring provinces, and its ability to cope with competitive threats is weak.

The actual growth of the tertiary industry in

Henan Province from 2005 to 2016 generally showed a trend of the fluctuant decline then increase but the growth rate slowed down. Its average value was 5.43%, which was higher than that of the national growth component of 4.46%, indicating that the tertiary industry is the growth sector in Henan Province. The extra nearly 1 percentage point also reflects the advantages and development momentum of the tertiary industry in Henan Province. The average of total deviation is 0.97% and the contribution of the proximity-regional growth component and the proximity-efficiency component are respectively 230% (=2.23/0.97) and -115% (=-1.12/0.97). This indicates that the development of tertiary industrial in neighboring provinces brought about the demonstration and agglomeration effect which have obvious driving effects on Henan Province. But Henan Province has not fully utilized this positive externalization and has not cultivated strong advantages to cope with the competition challenge. Specifically, the proximity-rationale growth component shows a trend from falling stably to recovering sharply till growing slowly. In recent years, the values mostly were positive. Although the width of growth has declined, the positive externalization of spatial agglomeration are still significant. The trend of proximity-efficiency component is just the opposite. It is clearly from rising reluctantly to falling sharply, then from recovering gradually to dropping steadily. After the gradual improvement of competitiveness from 2005 to 2009, there was a sharp decline in 2010. From 2012 to 2013, the tertiary industry in Henan Province has improved its competitive advantage compared with neighboring provinces, which greatly promoted the development of the tertiary industry. However, in the past three years, there has been a cliff-like decline, which means that the competitive disadvantage has emerged. And as the time node stretches, it shows a significant hindrance to the development of the tertiary industry.

2.4 Shift-share analysis chart

One plane rectangular coordinate system is established by taking the total deviation as the abscissa and the national growth component as the ordinate. The other is established by taking the proximity-efficiency component as the abscissa and the proximity-rationale growth component as the ordinate. Each coordinate system plane is divided into 8 sectors. Then use the average value of indicators from 2005 to 2016 to draw dot in the figure. Finally complete the department advantage analysis chart and the department deviation component analysis chart as shown in Fig.1.

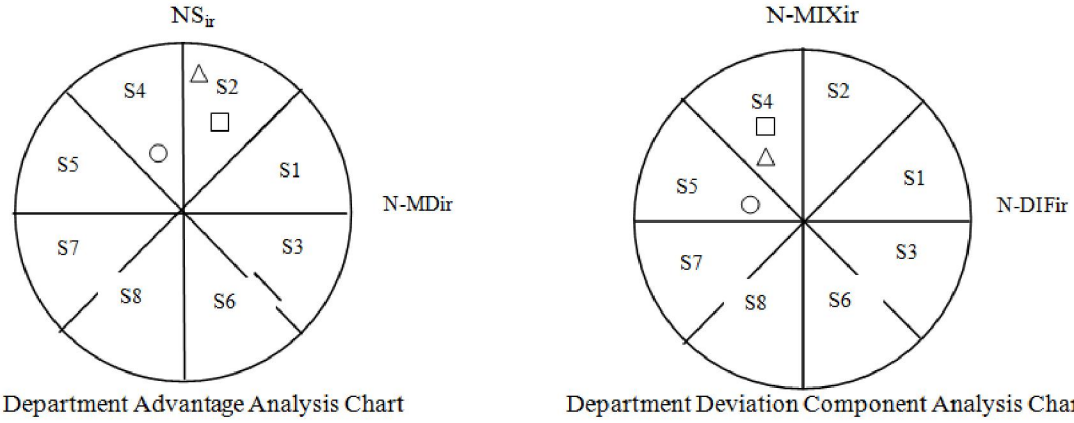

Fig.1 Shift-share analysis chart of industrial competitiveness in Henan (○,Δ and □ respectively indicate the primary, secondary and tertiary industries)

According to the evaluation system, in the departmental advantage analysis chart, the primary, secondary and tertiary industries are in the S4, S2 and S2 quadrants, indicating that the primary industry is the growing sector of Henan Province without departmental advantage, while the secondary industry and tertiary industry are the growing sectors with departmental advantage in Henan Province. In the department deviation component analysis chart, the primary, secondary and tertiary industries are located in the S5, S4 and S4 quadrants respectively, indicating that the three industries in Henan Province have built the good industry foundation after the economic construction for many years. They also have cultivated unique competitiveness but haven't formed a strong competitive advantage.

3. Conclusions and recommendations

According to the analysis results of the spatial expansion model of Shift-share Method, the following conclusions can be drawn. First of all, the three industries in Henan Province are all growing sectors, but there are big differences. The primary industry is in recession and its competitiveness is low. The secondary and tertiary industries have certain competitiveness but lack of growing motivation even appear a downward trend. Secondly, the contribution of the proximity-rationale growth component to the total deviation gradually increases, indicating that the development of Henan's industry is greatly affected by neighboring provinces. The proximity-rationale growth components of the three industries all have changed from negative values to positive, reflecting the regional economic growth has gradually played a positive role in the improvement of industrial competitiveness in Henan Province. But the downward pressure is relatively large. Finally, the proximity-efficiency components are mostly negative values in the time series, indicating that the three industries in Henan Province have not fully utilized the positive externalization under the spatial agglomeration effect. They also have not cultivated strong competitive advantages to cope with market risks and challenges. The recovering trend in recent years also reflects that favorable factors have appeared in the industrial sector of Henan Province which can improve competitiveness.

Further, in order to improve the industrial competitiveness in Henan Province，the first task is to clarify the direction of industrial development and optimize industrial policies. On the one hand，attach importance to the development of modern agriculture. On the other hand, maintain and cultivate the core competitiveness of the secondary and tertiary industries, especially the advantages of the spatial industry. The specific measures can be expanded as follows.

(1) Develop modern agriculture Vigorously. As a large grain province, Henan Province has a good resource advantage to develop agriculture. But its competitiveness is weak. It is urgent to change development thinking. It is necessary to continuously improve the infrastructure and improve the means of production. Achieving mechanization and intensive production according to local conditions is also meaningful for Hanan Province to improve efficiency and make up for the shortcomings. It is also important to speed up the construction of agricultural technology research and development and extension system, and the progress of agricultural socialization service system. At the same time, to improve the quality and scientific and technological content of agricultural products, social forces should play the positive role in the production, processing, circulation and marketing of agriculture so that the development momentum can enhance. In addition, Henan Province must pay attention to develop ecological agriculture and characteristic agriculture. They should not only learn from the benign cycle development model of Baofeng County Ecological Agriculture Experimental Zone in Pingdingshan city, but also popularize the successful experience of famous agricultural products such as Xinzheng Jujube and Yuanyang Rice. This kind of chain-like development way can enhance sustainable development capabilities of the agriculture and foster competitiveness.

(2) Encourage the development of agricultural products processing industry. In order to realize the industrial concept change from big grain warehouse to big kitchen for Henan Province, the agricultural product processing industry is the key carrier. The importance of its development to improve the competitiveness of the secondary industry in Henan Province is self-evident. In addition to preferential national policies and financial support from financial institutions, agricultural product processing enterprises should also establish a correct development strategy, adhere to the market-oriented, and enhance the response capacity and flexibility which needs establish an early warning mechanism, conduct market research, and set up a market information network platform. Therefore the diverse needs of agro-processed products from consumers can be satisfied. Moreover, Henan Province should also give full play to the demonstration role of leading enterprises in agricultural products processing industry, such as Sanquan Food Company and Haoxiangni Health Food Company. Thus to promote and force the development of other small and medium-sized enterprises. Besides, helping introduce advanced management experience and development model, or sharing technology is also able to accelerate the process of industrial restructuring and upgrading and foster competitive advantages.

(3) Accelerate the cultivation and support of the modern service industry. The reason that the tertiary industry in Henan Province lacks significant competitiveness, essentially is lack of high-tech support and poor industrial soft environment. To cultivate core competitiveness, Henan Province must strengthen scientific and technological innovation, break the old-fashioned thinking, improve the cultural environment for industrial development, and vigorously develop knowledge and intellectual-intensive industries such as modern financial industry and information industry, especially strategic emerging industries. In the context of the current *Made in China* gradually moving towards *Chinese wisdom*, there are more and more industrial

clusters development zones with comparative advantages in the central provinces in recent years, such as Anhui's artificial intelligence, Hunan's digital creativity, and Jiangxi's general aviation, etc. Henan Province should seize the opportunity and actively learn from the learning experience. For one thing, adhere to the talent and technology orientation and actively promote the agglomeration of innovative enterprises. For another, enrich the content and depth of industrial agglomeration on the basis of rational planning. Meantime actively and selectively explore complementary and efficient business models and forms of cooperation.

References

1. Nazara, Hewings GJD. Spatial structure and taxonomy of decomposition in shift-share analysis [J]. Growth and Change, 2004, (35):476-490.
2. Akihiro Otsuka. Regional energy demand in Japan: dynamic shift-share analysis [J]. Energy, Sustainability and Society, 2016, 6 (1), 1-10.
3. Gian Pietro Zaccomer, Pamela Mason. A new spatial shift-share decomposition for the regional growth analysis: a local study of the employment based on Italian Business Statistical Register [J]. Statistical Methods & Applications, 2011, 20 (3), 329-356.
4. Ding Hao, Wang Jiaming, He Lewei. An Empirical Analysis of Industrial Structure and Industrial Competitiveness in Shandong Province——Based on Dynamic Deviation Share Space Expansion Model [J]. Science and Technology Management Research, 2015, 35(10):114-119.
5. Shi Chunyun, Zhang Jie, Gao Wei, Yang Yang. A Review of Foreign Deviation-Share Analysis and Its Extended Model Research [J]. Exploring Economic Issues, 2007, (03):133-136.
6. Information Resources Development Department. Analysis of the development situation of strategic emerging industries in 2017[EB/OL]. http://www.sic.gov.cn/News/459/8478.htm

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