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Comprehensive Analysis of Regional Development Differences in Shandong Province

——Based on the Data in the Years 1990, 2000 and 2008

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Abstract According to the relevant data in the years 1990, 2000 and 2008, principal component analysis method is used to select a total of 36 indices to construct the comprehensive evaluation index system reflecting the regional development differences from the three aspects of the regional economic development, the social development and the resource and environment development. Development differences among a total of 16 cities in Shandong Province are comprehensively analyzed. Result shows that in the years 1990-2008, the comprehensive scores of Qingdao and Jinan are the highest in Shandong Province. Comprehensive scores and ranks of Weihai, Yantai and Dongying are steadily improved. Zibo and Zaozhuang Cities show a downward trend in the comprehensive scores and ranks. Comprehensive scores of Heze and Liaocheng Cites, located in the northwest region, rank the last in Shandong Province. Shandong Peninsula and the areas along the Jinan-Qingdao railway line still have the most powerful comprehensive strength. There are still regional differences between eastern and western areas and the gap between the two is increasing. Spatial structure of regional development in Shandong Province has changed from the traditional two-center agglomeration pattern to the whole agglomeration of city cluster in Shandong Peninsula. Therefore, Shandong Province has initially realized the transformation of regional development pattern.

Key words Shandong Province, Regional development differences, Comprehensive score, China

During difference analysis in regional development, scholars use standard deviation, location entropy, absolute deviation and other research methods to evaluate the scale and spatial evolution characteristics of regional differences. At present, there are a large amount of research results about regional economic differences in Shandong Province. Regional differences are compared usually by single target or multiple target, which can not completely, comprehensively or continuously reflect the changes of regional comprehensive development differences. Therefore, this paper uses integrated measurement differences method to carry out comprehensive evaluation on the regional development differences in Shandong Province since the 1990s, and to further analyze the temporal change characteristics of comprehensive development differences[1].

1 Data source and research method

1.1 Data selection and processing Factor analysis is carried out by SPSS11.5 software, according to the 1991, 2001 and 2009 *Shandong Statistical Yearbook*. First of all, standardized treatment on data is carried out, and then, SPSS software is used to calculate the correlation coefficient matrix *R* and the eigenvalue of matrix *R*. In accordance with the principle of eigenvalue greater than 1, the main factor is selected. According to the loading matrix of rotation factor, scores of main factors are calculated. And proportion of factor variance after rotation is taken as the comprehensive weight in order to obtain the comprehensive score of research units.

1.2 Research method Principal Component Analytical Method is a statistical method that simplifies the original targets into a few indices with representative meaning, so that the original index can more typically and intensively reflect the characteristics of research object through reflecting the principal factor extraction of major original information. Therefore, according to the principles and steps of Principal Component Analysis Method, SPSS11.5 software is used to process the original data of 17 cities in Shandong Province. In order to achieve the continuity of comparison and to maintain the consistency of administrative divisions, Laiwu City is divided into Taian City.

2 Construction of index system

A total of 36 indices are selected to construct the comprehensive evaluation index system of regional development differences from three aspects of the regional economic development, the social development and the resource and environmental development.

2.1 Regional economic development It reflects the index of regional economic development, including the total GDP (X_1), growth rate of GDP (X_2), per capita GDP (X_3), per unit land GDP (X_4), local financial revenue (X_5), per capita local financial revenue (X_6), per capita output value of scale enterprises (X_7), per capita gross agricultural output value (X_8), proportion of non-agricultural added value in GDP (X_9), proportion of tertiary industry added value in GDP (X_{10}), industrial labor productivity (X_{11}), and per capita investment in fixed assets (X_{12}).

2.2 Regional society development It reflects the index of

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regional social development, such as total population (X_{13}), proportion of non-agricultural population (X_{14}), total employees (X_{15}), proportion of employees in secondary industries and tertiary industries (X_{16}), disposable income of urban residents (X_{17}), per capita net income of farmers (X_{18}), per capita consumption expenditure of urban residents (X_{19}), per capita consumption expenditure of farmers (X_{20}), per capita balance of savings of urban and rural residents (X_{21}), per capita total retail sales of social consumer goods (X_{22}), per capita expenditure on education (X_{23}), number of beds per ten thousand people (X_{24}), number of health technical personnel (X_{25}), number of students in secondary vocational schools (X_{26}), per capita road area (X_{27}), per capita green area of park (X_{28}), postal and telecommunicational professional quantity (X_{29}), highway passenger transportation volume (X_{30}), highway freight volume (X_{31}) and number of fixed phone users (X_{32}).

2.3 Resource and environment development It mainly adopts the indices having close relationship with resource and environment development, such as administrative area (X_{33}), per capita cultivated area (X_{34}), per capita comprehensive utilization of solid waste (X_{35}), and per capita investment in industrial pollution control project (X_{36}).

3 Comprehensive evaluation on the regional development differences in Shandong Province

3.1 Comprehensive evaluation on the regional development differences in the year 1990 A total of 6 principal factors are obtained by factor analysis of the data in the year 1990, with its cumulative contribution rate of 90.181%. Factor loading analysis is carried out by using factor rotation method with the largest variance. Proportions of factor variances after rotation are 0.286, 0.230, 0.136, 0.114, 0.082 and 0.053, respectively, which are taken as the weights to calculate the evaluation scores of comprehensive strength of research unit (Table 1).

Table 1 Comprehensive scores of cities in Shandong Province in the year 1990

Area	Comprehensive score	Rank	Area	Comprehensive score	Rank
Jinan	0.563	2	Taian	−0.086	9
Qingdao	0.917	1	Weihai	0.181	5
Zibo	0.492	3	Rizhao	−0.414	14
Zaozhuang	−0.120	10	Linyi	−0.425	15
Dongying	0.032	7	Dezhou	−0.307	11
Yantai	0.443	4	Liaocheng	−0.393	13
Weifang	0.044	6	Binzhou	−0.366	12
Jining	−0.060	8	Heze	−0.501	16

Table 1 shows that comprehensive score of Qingdao City is the highest and that of Heze City is the lowest, which have 15-fold difference (after the standardized treatment of score). Comprehensive score of seven areas is positive; and that of nine areas is negative.

3.2 Comprehensive score of regional development differences in the year 2000 Factor analysis is conducted according to the data in the year 2000, so as to obtain a total of 6 principal factors with the cumulative contribution rate of 91.141%. Factor rotation method with the maximum variance is conducted. And the proportions of factor variance after rotation are 0.318, 0.285, 0.116, 0.083, 0.068 and 0.040, respectively, which can be used as the weights to calculate the evaluation scores of the comprehensive strength of research unit (Table 2).

Table 2 Comprehensive scores of cities in Shandong Province in the year 2000

Area	Comprehensive score	Rank	Area	Comprehensive score	Rank
Jinan	0.907	1	Taian	−0.006	7
Qingdao	0.853	2	Weihai	0.247	5
Zibo	0.367	4	Rizhao	−0.372	13
Zaozhuang	−0.231	10	Linyi	−0.3	11
Dongying	−0.09	8	Dezhou	−0.342	12
Yantai	0.4	3	Liaocheng	−0.485	15
Weifang	0.143	6	Binzhou	−0.461	14
Jining	−0.03	9	Heze	−0.6	16

Table 2 indicates that comprehensive score of Jinan has risen to the first place in the whole province, but there are little differences between the scores of Jinan and Qingdao. Heze City has the lowest score, and the difference between Jinan and Heze is more than 16 times (after the standardized treatment of score). Comprehensive score of the six areas is positive, and that of the ten areas is negative. Compared with the year 1990, comprehensive score of Jinan City has the fastest growing speed. Variation of Jinan City takes the second place just next to Linyi City, up by 4 ranks.

3.3 Comprehensive score of regional development differences in the year 2008 Factor analysis is conducted according to the data in the year 2008, so as to obtain a total of 6 principal factors with the cumulative contribution rate of

87.57%. Factor rotation method with the maximum variance is conducted. And the proportions of factor variance after rotation are 0.377, 0.203, 0.089, 0.074, 0.068 and 0.063, respectively, which can be used as the weights to calculate the evaluation scores of the comprehensive strength of research unit (Table 3).

Table 3 indicates that comprehensive score of Jinan is the maximum and that of Heze is the minimum, which have 16-fold difference (after the standardized treatment of score). Comprehensive score of the seven areas is positive, and that of the nine areas is negative. Comprehensive score of Weihai City has exceeded that of Yantai, only next to Jinan, and takes the third place in the whole province. Compared with the year 2000, comprehensive scores of Dongying and Binzhou have risen by three ranks, and that of Zaozhuang has dropped sharply to the fourteenth place. And the comprehensive scores of Zibo and Weifang have also declined.

3.4 Cluster analysis of the comprehensive score of regional development differences in different years Hierarchical cluster analysis is conducted after the standardized treatment of comprehensive score by SPSS11.5 statistical analysis software. And Euclidean distance measurement method is used to classify the comprehensive score of areas in the years 1990, 2000 and 2008 (Table 4).

Table 3 Comprehensive scores of cities in Shandong Province in the year 2008

Area	Comprehensive score	Rank	Area	Comprehensive score	Rank
Jinan	0.552	2	Taian	−0.095	8
Qingdao	0.919	1	Weihai	0.446	3
Zibo	0.251	6	Rizhao	−0.493	15
Zaozhuang	−0.442	14	Linyi	−0.151	10
Dongying	0.295	5	Dezhou	−0.401	12
Yantai	0.432	4	Liaocheng	−0.434	13
Weifang	0.202	7	Binzhou	−0.329	11
Jining	−0.101	9	Heze	−0.652	16

Table 4 Classification of comprehensive evaluation scores in different areas of Shandong Province in the years 1990, 2000, 2008

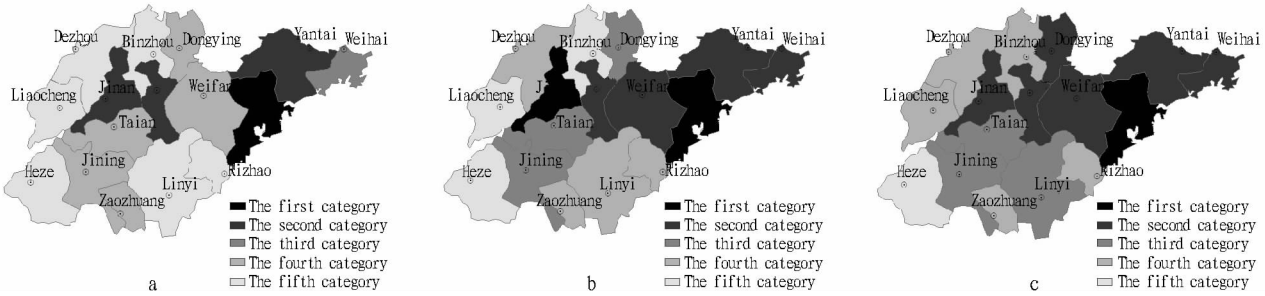
Category	1990	2000	2008
The first category	Qingdao	Jinan, Qingdao	Qingdao
The second category	Jinan, Zibo, Yantai	Yantai, Zibo, Weihai, Weifang	Jinan, Weihai, Yantai, Dongying, Zibo, Weifang
The third category	Weihai	Taian, Jining, Dongying	Taian, Jining, Linyi
The fourth category	Weifang, Dongying, Jining, Taian, Zaozhuang	Zaozhuang, Linyi, Rizhao, Dezhou	Binzhou, Dezhou, Liaocheng, Zaozhuang, Rizhao
The fifth category	Rizhao, Linyi, Dezhou, Liaocheng, Binzhou, Heze	Binzhou, Liaocheng, Heze	Heze

Table 4 indicates that with time goes by, development levels among areas have relatively great differences. Qingdao and Jinan, the political and economic centers of Shangdong Province, are at the first echelon of regional development, belonging to the relatively stable developed region. Gap between Jinan and Qingdao has been growing since the year 2000. Relatively developed regions belonging to the second category are increasing. Among them, Weihai City has the fastest growing speed, and its comprehensive strength is greater than those of Yantai, Zibo and Weifang. Areas belonging to the second category have increased, but the fluctuation of city rank is relatively great. Affected by the exhausted coal resources, development strength of Zaozhuang City has been greatly diminished from the tenth place in the year 2000 to the last but three in the year 2008. Taian and Jining belong to the traditional industrial cities with imbalanced industrial structure and little change of the rank of comprehensive strength. But the overall development speed has lagged behind the peninsula cities and Dongying City. In recent years, Linyi City has developed rapidly with the steady improvement of comprehensive strength. Areas belonging to the fifth category are reducing; comprehensive strength and the order of Binzhou Area have improved, while those of Rizhao City have decreased. Under the same development level, comprehensive strength and the order of Heze City still take the last place due to the impact of various factors.

In the years 1990, 2000 and 2008, scores of areas with positive comprehensive score are 26.72, 29.16 and 30.98, respectively, indicating that the gap of regional development is widening. In order to better reflect the changes in regional differences, the first three categories are divided into the first group and the latter two categories are classified into the second group. In the years 1990 −2008, differences between absolute values of the comprehensive scores of the first and second groups are 1.52, 2.53 and 6.92, indicating that regional gap between the two groups is widening. Assuming that the regional comprehensive score is zero, increase of regional disparity shows that the scores of the second and third categories show an upward trend; while those of the fourth and fifth categories show a decreasing trend.

3.5 Pattern changes of regional development differences in Shandong Province in the years 1990 −2008 Fig. 1 illustrates the change process of comprehensive score rank and the schematic diagram of regional classification in Shandong Province in the years 1990, 2000 and 2008. Analysis shows that, firstly, Shandong Peninsula and Qingdao − Jinan Railroad are still the areas having the most powerful comprehensive strength

in Shandong Province. Both the development level and speed are at the forefront of the province. Secondly, regional disparity still exists between western and eastern areas of Shandong Province, and the disparity is increasing. Thirdly, comprehensive strengths of central and central-south Shandong have been improved, but that of northwest Shandong still lags behind. For instance, although Rizhao City has achieved rapid development of port economy in recent years, the backward economy of its administrated county affects the improvement of its overall strength. Fourthly, in the years 1990 – 2008, spatial structure of regional development in Shandong Province is characterized by the evaluation from the two-center agglomeration pattern to the overall agglomeration of city cluster in Shandong Peninsula, with a ring structure of "core—periphery". Fifthly, during the process of regional development, both agglomeration and dispersion coexist. There is mainly agglomeration in the years 1990 – 2000, and it has transited to point – axis type agglomeration. In the years 2000 – 2008, gradual dispersion process of point – axis type comes into existence, with Weihai – Qingdao – Jinan – Jining as the main axis of dispersion. Sixthly, regional development difference of Shandong Province shows strong spatial correlation, mainly reflecting the extreme significant spatial relationship between regional economic growth and residents' income since the year 2000. It is characterized by the widening inter-regional differences and the strong correlation in east and weak correlation in west[2].



Note: a, b and c are the schematic diagrams of development types in the years 1990, 2000 and 2008.

Fig. 1 Schematic diagram of the regional development type in Shandong Province in the yeas 1990, 2000 and 2008

4 Conclusion and discussion

In the years 1990 – 2008, there still exists gap between east and west Shandong and the gap is widening, which is similar with the research results of Yang Xiaobo[3-7]. Changes of comprehensive score of the 16 areas show that Jinan and Qingdao are still cities having the strongest comprehensive development strength in Shandong Province; comprehensive strength of Wihai City grows the fastest, and those of Zibo and Zaozhuang Cities gradually decrease. Moreover, comprehensive strength of Linyi City gradually increases; while those of Heze and Liaocheng are in the terminal positions. Spatial structure of regional development in Shandong Province has changed from the two-center agglomeration pattern to the overall agglomeration of city cluster in Shandong Peninsula, with a ring structure of "core—periphery".

Factors affecting the regional differences are various. Through multiple regression analysis on the impact degree of factors, major factors affecting the economic difference in Shandong Province are found out. Combined with the comprehensive evaluation of differences in regional development, policies about regional balanced development are formulated and implemented.

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退耕还林(草)不同经营模式对农村经济影响的分析

——以陕西省吴起县为例

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摘要 以陕西省吴起县为例,在介绍研究区概况的基础上,依据当地种植模式和影响经济效益的因素,经过系统分析和筛选,选取生态林、林—草—牧、林—药、经济林和大棚蔬菜5 种退耕还林(草)经营模式,选择吴旗镇、白豹镇、吴仓堡乡、新寨乡、薛岔乡和五谷城乡 6 个乡镇为样本地,对每个乡镇的5 种模式分别从乡(镇)、村、农户 3 个层次采用参与性农村评估和文献查阅相结合的方法进行调查访问获取相关数据,采用方差分析法对吴起县退耕还林(草)工程5 种经营模式的经济效益进行分析比较,确定各种经营模式对农村经济效益不同程度的影响。结果表明,各种模式之间有显著性差异;除经济林模式和林—药模式之间没有显著性差异外,其余各模式均达到差异极显著性;林—草—牧模式和经济林模式的效果最好,分别位于1、2 位,林—药、生态林和大棚蔬菜模式分别位于3、4、5。

关键词 模式;吴起县;退耕还林(草);经济效益

(From page 4)

山东省区域发展差异的综合分析——基于1990、2000 和2008 年的数据

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摘要 依据1990、2000、2008 年相关数据,利用主成份分析方法,从区域经济发展、社会发展和资源与环境发展3 个方面,选取36 个指标构建了反映区域发展差异的综合评价指标体系,对山东省16 个地级市发展差异进行综合分析。结果表明,1990 ~2008 年,青岛与济南综合得分稳居山东省省前列,威海、烟台、东营等区位与资源富庶的地区综合得分与位次稳步提升,淄博、枣庄等传统工业城市综合得分呈下降趋势,地处鲁西北菏泽、聊城等地区综合得分位列全省末位;山东半岛与胶济沿线依然是山东省综合实力最强的地区,东、西部间区域差距格局继续存在,且有持续拉大的趋势;山东省区域发展的空间结构由传统的双中心集聚格局转变为山东半岛城市群的整体集聚,初步实现由点、点轴结合、再到点与面结合带动的区域发展格局的转变。

关键词 山东省;综合得分;区域发展差异