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# Research on regional economic differences and its application

**Chunguang Zhao\*, Ying Hao**
**College of Mathematics and Physics, Handan College, Handan 056005, (CHINA)**
**E-mail : zhaochunguang888@126.com, haoying811009@126.com**

## ABSTRACT

This article takes 11 cities of Hebei Province as the object of study. According to Hebei Province's actual situation, we choose 6 important variables, which reflect the regional economies level of development. By analysing the data collected, the 11 regions of Hebei Province are divided into fourtypes: the developed, the more developed, the medium and the backward. And there is large differ-ence between the four types of regions. To further promote and realize coordinated development of theHebei Province economy, we should take measures to narrow the gap including making distinctive economic zone and business circle, promoting the regional harmonious development, developing the coastal economic belt and improving the underdeveloped region self-development capabilities.

## KEYWORDS

Hebei province; Regional economies; Coordinated development; Principal components analysis; Cluster analysis.

## INTRODUCTION

As the country continued to increase the pace of economic reform, Hebei Province, rapid economic development, economic strength and level has been among the ranks of the largest economy in the province[1]. However, economic development in Hebei province and there is a great gap between the economy, there are still many problems, especially in provincial cities between speed and level of economic development there is a clear imbalance, this imbalance has become Hebei Province, an important bottleneck restricting economic sustainable development. This paper intends to select appropriate indicators based on the specific circumstances of Hebei Province, using principal component analysis and cluster analysis of regional economic development in Hebei province were discussed[2-5].

## SELECT MODEL

In the process of regional economic conduct of the study, involving regional characteristics describe a statistical data are often a lot of correlation between these data, how to select data from a number of valuable data is very difficult problem. In the actual study, if the selected statistics too much, not only make the problem becomes complicated and potentially increasing the difficulty of the study; Instead, select too few statistics, we can not guarantee that a greater impact on the real selected findings data, it can not guarantee the authenticity and reliability of the findings. To solve this problem, we have chosen a more ideal multivariate statistical tools --- principal component analysis. Principal component analysis is to reflect the characteristics of the sample a number of indicators variables into a few comprehensive multivariate statistical methods variables[4-8].

Normally, we use squared deviation or variance and described the "information" is the amount of size. In the case of the maximum retention of valuable information from multiple indicators to identify the few independent of each other by changing the composite indicator, as the main component of its original targets, and reflect the information of the original data as much as possible. This is determined by the number of indicators representative of a linear combination of the original index, represented by a linear transformation to a new linear dimensional random vector is generated independent variables. In mathematical transformation, the new integrated variables remain independent of each other, the overall variance remains unchanged[9-11].

Before the larger integrated variable selection variance in the actual work Surface as a main component of several variables, depending on the selection of the minimum number of characteristic values or limits required contents of the accumulated information. This results in both the number seize the main contradiction and make the index is greatly reduced, but also eliminates the correlation between indicators. In this paper, the cumulative contribution rate by a factor of criteria to select the optimal number of the main factors. Cumulative contribution rate must be greater than 85% can be selected parties, otherwise give up.

## REGIONAL ECONOMIC EQUILIBRIUM ANALYSIS

### Select Index

Index selection is comprehensive, comparable, practicality and ease of operation as the main principle. This paper chose the six economic indicators for the study, namely: X1: per capita GDP (yuan); X2: value ($ billion); X3: per capita investment in fixed assets (yuan / person); X4: proportion of primary industry (%); X5: the proportion of secondary industry (%); X6: proportion of tertiary industry (%). This six indicators from different layers reflect the economic benefits of regional development, scale, technical level and industrial structure rationalization and peers[7-9].

11 cities in Hebei geographical unit, refer to the relevant data "in Hebei Economic Yearbook 2011" compiled data sample points geographical unit, constructed 11x6-dimensional data table (see Table using UDP values derived by dividing the number of employees the values in TABLE 1 reflect the region's economic output efficiency and labor inputs; economic scale region is represented by X2;

technical condition of the region represented by X3; structural level of long-term economic development in the region is reflected in X4, X5, X6.

**TABLE 1 : The main economic variables cities in Hebei Province**

| Sample No. | region | X1 | X2 | X3 | X4 | X5 | X6 |
|---|---|---|---|---|---|---|---|
| 1 | Shijiazhuang | 50951 | 1239.78 | 29070.65 | 0.62 | 29.16 | 70.22 |
| 2 | Chengde | 35117 | 206.36 | 21611.69 | 2.34 | 57.95 | 39.71 |
| 3 | Zhangjiakou | 35597 | 361.49 | 20782.93 | 2.25 | 55.71 | 42.04 |
| 4 | Qinhuangdao | 53643 | 531.01 | 16913.95 | 1.39 | 40.79 | 57.82 |
| 5 | Tangshan | 73639 | 2262.65 | 35157.35 | 4.37 | 60.84 | 34.79 |
| 6 | Langfang | 38515 | 334.31 | 20830.78 | 6.92 | 41.64 | 51.44 |
| 7 | Baoding | 48871 | 543.4 | 13134.14 | 1.27 | 59.89 | 38.84 |
| 8 | Cangzhou | 69093 | 429.25 | 20271.98 | 1.21 | 59.93 | 38.86 |
| 9 | Hengshui | 37435 | 172.5 | 10962.8 | 8.57 | 60.08 | 31.35 |
| 10 | Xingtai | 29331 | 217.05 | 14343.5 | 0.81 | 64.53 | 34.66 |
| 11 | Handan | 38500 | 544.48 | 19972.95 | 0.91 | 58.28 | 40.81 |

## Principal component analysis

Operational SPSS software to collate raw data, the maximum variance method (Varimax) rotation. The results are shown in TABLE 2. As can be seen from TABLE 2, the variance contribution rate of the first two principal components rotated to 39.8579%, 34.935% and 14.473%, respectively. Variance contribution rate is 89.265%, which shows the change in the front and a few of the original variables can be used to change the value of the first three principal components to represent. That these can be used as the main component of a comprehensive evaluation of the economic strength of the variables of each city, Hebei Province. Meanwhile obtained before the main ingredient load rotation matrix (see Table emperor with rotating components loading matrix (see TABLE 4).

**TABLE 2 : Total variance analysis table**

| | Before the rotation | | | After the rotation | | |
|---|---|---|---|---|---|---|
| | Eigen values | Variance contribution rate | Cumulative contribution rate | Eigen values | Variance contribution rate | Cumulative contribution rate |
| 1 | 2.74 | 45.663 | 45.663 | 2.391 | 39.857 | 39.857 |
| 2 | 1.748 | 29.129 | 74.792 | 2.096 | 34.935 | 74.792 |
| 3 | 0.975 | 16.257 | 91.049 | 1.228 | 14.473 | 88.626 |
| 4 | 0.423 | 7.044 | 98.093 | | | |
| 5 | 0.114 | 1.907 | 100 | | | |
| 6 | 0 | 0 | 100 | | | |

**TABLE 3: Rotation matrix before the main component of the load**

| | 1 | 2 | 3 |
|---|---|---|---|
| Z 1 | 0.685 | 0.505 | 0.057 |
| Z 2 | 0.817 | 0.494 | 0.263 |
| Z 3 | 0.86 | 0.29 | -0.3 |
| Z 4 | -0.243 | 206 | 0.916 |
| Z 5 | -0.618 | 0.74 | -0.3 |
| Z 6 | 0.649 | -0.758 | 0.073 |

TABLE 4 rotary table emperor component loading matrix

|  | 1 | 2 | 3 |
|---|---|---|---|
| Z 1 | 0.685 | 0.505 | -0.208 |
| Z 2 | 0.817 | 0.494 | 0.051 |
| Z 3 | 0.86 | 0.29 | -0.481 |
| Z 4 | -0.243 | 206 | 0.961 |
| Z 5 | -0.618 | 0.74 | -0.114 |
| Z 6 | 0.649 | -0.758 | -0.122 |

Shown in TABLE 4 according to the rotation of the factor loading matrix, can be given three principal components analysis. The first principal component variables and indicators on output per capita investment in fixed assets with a load capacity greater than 0.8, the load capacity per capita output was 0.685 (more than 0.5) so that the first principal component reflects the region's labor input output efficiency and economies of scale, but also to some extent. Reflect the state of technology in the region reached its maximum contribution rate 39.857% second main ingredients in the proportion of secondary industry and tertiary industry index variable larger load capacity primarily reflects the structural level of long-term regional economic development in the first tertiary industry was 34.935% of its variance third principal component loads on the proportion of primary industry indicator variables is greater than 0.9 mainly reflecting the long-term regional economic development level of the first industrial structural variance contribution rate after this paper was 14.473% of principal component regression analysis to calculate the factor scores in calculating the overall score you need to select a reasonable right to reuse the variance of each principal component accounts for three main components of the proportion of the total variance contribution rate as weights and then summing the weighted composite score derived cities in Hebei Province[10].

$$F = \frac{39.857\% \times F_1 + 34.935\% \times F_2 + 14.473\% \times F_3}{89.265\%}$$

The main component of which the main component of a principal component 3, respectively, with F1, F2, F3 said that arrangement if the level is higher than the average level of regional economic development is being partitioned according to descending order. Level of economic development field is negative points below the average level I[11-13]. They put the composite score as the economic strength of the cities in Hebei comment. Standard price reflects the economic strength between the results of its main characteristics are shown in TABLE 5 cities Generally speaking, Hebei Province, the economic strength of the country is extremely uneven levels of development there are regional differences in Shijiazhuang, Tangshan City and the highest value of its comprehensive strength evaluation scores were 0.98662 and 0.94176 and the lowest Zhangjiakou only -0. 62239.

**TABLE 5 : Economic strength and the integrated evaluation of 11 cities of hebei sorting table**

| Sample No. | region | F 1 | F 2 | F 3 | F | order |
|---|---|---|---|---|---|---|
| 1 | Shijiazhuang | 0.66655 | 2.26335 | -1.21375 | 0.98662 | 1 |
| 5 | Tangshan | 2.63153 | -0.95573 | 0.86852 | 0.94176 | 2 |
| 4 | Qinhuangdao | 0.49126 | 1.15454 | -0.30101 | 0.62239 | 3 |
| 6 | Langfang | -0.48665 | 0.68032 | 1.83574 | 0.3466 | 4 |
| 8 | Cangzhou | 0.527 | -0.50659 | 1.19464 | 0.23074 | 5 |
| 7 | Baoding | -0.2809 | -0.45333 | 1.88324 | 0.0025 | 6 |
| 11 | Handan | -0.22469 | -0.16995 | -0.84516 | -0.30387 | 7 |
| 2 | Chengde | -0.44912 | -0.22082 | -0.40012 | -0.35183 | 8 |
| 10 | Xingtai | -0.8878 | -0.65132 | 0.5545 | -0.5614 | 9 |
| 9 | Hengshui | -0.89082 | -1.09639 | 1.39461 | -0.60072 | 10 |
| 3 | Zhangjiakou | -0.20179 | -0.04409 | -0.22614 | -0.62239 | 11 |

TABLE 5 shows the economic strength score greater than 0. There are six remaining cities are below average contribution. There are three rates of the largest city on the second factor was the proportion of tertiary industries. Less than a third of the province's proportion greater than 0 in labor inputs. The overall output and regional economies of scale scores greater than 0. City just four in the first industry-level factor has 6 City. Economic strength level is greater than 0 score between cities are very different. Large composite score of the top five in Shijiazhuang, Tangshan City,Qinhuangdao, Langfang and Cangzhou City, the level of their economic strength Far more than a few other cities

## Type of sample is divided city

Based on the above principal component analysis applied K-means clustering method K-Meanscluster cluster analysis clustering variable is the level of economic development of all the city's comprehensive evaluation is based on analysis of these 11 cities can be developed into more developed type type medium type behind four types are shown in TABLE 6.

**TABLE 6 : Classification of economic power of 11 cities of hebei**

| classes | City | Type | The number |
|---|---|---|---|
| 1 | Shijiazhuang City Tangshan City | Developed | 2 |
| 2 | Qinhuangdao City | Less developed | 1 |
| 3 | Langfang City Cangzhou City Baoding City | Medium | 3 |
| 4 | Handan City Chengde City Xingtai City Zhangjiakou City Hengshui City | developing | 5 |

## ECONOMIC ANALYSIS OF THE STRENGTH OF THE TYPE OF SAMPLE

## Developed

There are two types developed city Shijiazhuang, Tangshan city. City Shijiazhuang, as the capital city of Hebei Province is the province's politics by Economic cultural and transportation center of it as an important work in Hebei. Industry City especially cotton industry and the pharmaceutical industry is developing rapidly our Cotton industry and medicine production base in Hebei Province, Village also has many preferential economic policies so that further accelerate. Development of Shijiazhuang, Tangshan City, Hebei Province as the eastern traffic Convenient transportation hub Jingha Beijing-Qinhuangdao railway through the territory of two easy. Development of transport and logistics industry in existing coal Tangshan Iron and Steel. Ceramics and other industrial machinery and electricity which is Tangshan Kailuan Coal Mine,One of the six mines of Tangshan there seven large power plants which. These have proved useful in Tangshan City is a city of one's economic strength. Therefore, the city should seize such opportunities to take advantage of favorable conditions for the development of the plot. Hebei Province to promote the rapid development of extremely economical.

## Less developed

More developed only one type of city that Qinhuangdao Qinhuangdao is a coastal city with a wealth of natural resources,while Numerous natural landscapes and historic landmarks in recent years, Qinhuangdao tourism has developed rapidly since 1984, after one of 14 coastal open cities Qinhuangdao

pace of reform. Accelerate the development of urban construction boom today with its unique Qinhuangdao. The charm of the resort which led to China's Qinhuangdao Economic development1.

## Medium

There are three medium-type city that Langfang, Baoding, Cangzhou and Langfang City in Hebei Province, north of the capital of the north-central east Days,Tianjin Economic Zone in Langfang City, is the capital of Beijing, the capital of the aid location. Advantage can accept Beijing's radiation while the traffic is very convenient, three expressways within a radius of 100 km range,road 2 International Airport a large cargo port Qinhuangdao to Beijing. Ba Jin Qin Shanghai-Kowloon railway and other major aspect in the country, Langfang nine counties in eight areas of protection are planning,Beijing-Kowloon Railway direct connection can be formed after the completion of the Beijing-Guangzhou line to tyrants. State of the Beijing-Tianjin railway ring pattern hub is located in Cangzhou City. Bohai heart is open, Hebei Province, two rings identified Beijing-Tianjin line region is also leading to the eastern coastal traffic arteries. Beijing-Shanghai railway and Beijing-Shanghai Railway Huang Shuo Shi Huang Expressway. Road at the intersection of the Beijing-Kowloon Railway in Cangzhou Huang Shuo Railway in Cangzhou City, Gansu County intersection and has a convenient transportation Marshalling Cangzhou hair Provide favorable conditions for development of Baoding location has Ease of access it is not far away from the urban area of Beijing and Tianjin. Leading to the capital and two major airports and definite Qinhuangdao, Tianjin and yellow Hua's three major ports located in downtown Beijing-Guangzhou railway, 107 State Road and Beijing, Shenzhen Railway line summary obvious advantages of such areas With a more favorable natural conditions favorable traffic location of mineral resources Rich with a good foundation for development and development conditions and vulnerable,The diffusion effect and trickle-down effect as the regional economic center of the city,If you can use the opportunity to seize the historical development from full. Advantage of the body will accelerate economic development in Hebei Province.

## Developing

Backward type Chengde, Handan City, Xingtai, Hengshui City, Zhang Zhangjiakou City. Hebei Province is the most developed area in Hebei Province, accounted for More than one third of their principal component scores are negative. The location of these southern and northern Hebei Province, located in the city and more remote from. Natural and geographical conditions of poor resource-poor economic development, water blocking traffic, residents of low level concepts obsolete ideological conservative cultural level and overall hormone. Low quality commercial awareness and market acceptance of poor awareness lack of information,Radiation economically developed areas of the city these poor economic backwardness. Restricting the overall economic development in Hebei Province. All in all regions due to the geographical location of each different owners. Basis of the development of the productive forces and some different natural resources and natural conditions. Different historical conditions and the uneven distribution of human resources so that each situation. A regional economic development level there are differences in economic development in Hebei Province. The overall trend is developing in the north-central portion of the developed model is higher than the north and south. More developed moderate type 6 first three regions located in the most Area behind the last row of the northern type of five city located substantially. North and South is located in remote areas, while ranking the province's economic reality, The top five market forces scattered across the province formed a radiation River. North Pole overall regional economic development in the province's cities have formed pole. Axis showed typical characteristics and traffic transportation hub located on Route. Characteristics drive shaft axis point for economic development in Hebei levy significant feature is the formation of the spatial distribution of economic Hebei Province.

Investment conditions in North Province municipalities divided into four categories as shown in TABLE 7.

**TABLE 7 : 11 city investment position classification table**

| classes | City | The number |
|---|---|---|
| 1 | Shijiazhuang City<br>Tangshan City | 1 |
| 2 | Qinhuangdao City<br>Cangzhou City | 2 |
| 3 | Langfang City Baoding City Hengshui City<br>Handan City Chengde City Xingtai City | 3 |
| 4 | Zhangjiakou City | 4 |

TABLE 7 shows that investing in good condition is located in the first two categories, City in Hebei Province and in the eastern part of the basic parts of the region than traffic. More developed with wealth of resources can be seen investment position. Differences are important aspects of regional economic disparities caused by Hebei Province.

## CONCLUSION

This article takes 11 cities of Hebei Province as the object of study. According to Hebei Province's actual situation, we choose 6 important variables, which reflect the regional economies level of development. By analysing the data collected, the 11 regions of Hebei Province are divided into four types: the developed, the more developed, the medium and the backward. And there is large difference between the four types of regions. To further promote and realize coordinated development of the Hebei Province economy, we should take measures to narrow the gap including making distinctive economic zone and business circle, promoting the regional harmonious development, developing the coastal economic belt and improving the underdeveloped region self-development capabilities.

## ACKNOWLEDGMENTS

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