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Index Evaluation Analysis of Economic Development on Beijing's Districts and Counties

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Abstract. This paper takes Beijing's districts and counties as the research object and establishes economic development index of Beijing's districts and counties. The development status of Beijing's districts and counties was evaluated and their difference on economic development was analyzed. The research conclusions can provide some reference for comprehensively grasping economic development of Beijing's districts and counties, scientifically planning and guiding economic development strategy during the Twelfth Five-Year Plan

Keywords: Index system, Regional economy, Development index.

1. Introduction

The economy of Beijing has maintained sustainable, rapid and healthy development since 2006. The economic development of each district and each county maintain a certain growth, but the development speed of each district and each county are not the same, for example the highest average annual growth rate of per capital GDP is Shunyi District and reached 32.08% from 2006 to 2009 and the lowest is Shijingshan District and reached 1.78%. Therefore there are certain differences among districts and counties in Beijing.

This paper establishes economic development evaluation index system about Beijing's districts and counties. It takes 14 districts and 2 counties adjusted in 2010 as research objects. The authors give comparative analysis about economic development of Beijing's districts and counties from 2006 to 2009 according to the index data collected from Beijing's authority departments. And the authors expect that the analysis results can provide some reference for government comprehensively grasping economic development of Beijing's districts and counties, scientifically planning and guiding economic development strategy during the Twelfth Five-Year Plan.

2. Index System

2.1. Selection Principle

Establishment of the index system should follow certain principles, this paper set up economy development evaluation index system according to the following principles.

(1) Operable Principles. This principle of index system is needed to follow first. The aim of establishing index system is to effectively applicate the actual analysis. So the indicators must be measurable, possessing the corresponding data supporting, instead of the one-sided pursuit the perfect theory. All indicators used in the indicator system factor must be clear in concept, clarity in content, and can be actually measured, as a result, they can carry out a quantitative analysis.

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(2) Comparable Principle. Comparability includes the following meanings: firstly, the basic index selected must use the generic name, concept, calculation method and index system as possible and they can comparable to other index. Secondly, a vertical comparability, that is taking the comparability between the evaluated areas in different periods into consideration when selecting index. The index trying to used is continuous data index, which can reflect the region development. Thirdly, horizontal comparison index, namely the establishment of indicator system should be helpful to compare the different objects of the same period.

(3) Scientific Principle. Scientific requirements the definition of index and calculation method should be under the guidance of theory . The explanation of each indicator, calculation method, classification should be scientific, authenticity, standardized, rigorous ,reasonable logic structure and basic concepts should be accurately defined.

(4) System Principle. Index established systematic is very important for the purpose of evaluation. For designing a index system, a theoretical framework should be set up, According to the index set by the framework, the selected index can form a hierarchy and the inner link index system. Economic development indicator mainly reflect economic development about Beijing's districts and counties. Each index establishment have to have rigorous scientific attitude, basing on the scientific research method and reflect the actual situation really and reasonably.

(5) Structural Hierarchy Principle. Comprehensive evaluation index system should present a structure hierarchy. Especially in the evaluation of a complex system, such as a comprehensive evaluation of regional economic strength. The composition of this system should include many factors of different levels, and different levels evaluation not only can get the evaluation results, but also can understand each level evaluation.

2.2. Index Selection

According to the above principles of index system establishment, this paper established evaluation index system as is showed in table 1, the corresponding data of each index is showed in table 2.

Table1 Economic development evaluation index system

Serial number	Index	Unit	Calculating method
1	Per capita GDP （x1）	yuan	Gross value/ Permanent population
2	Per capita resident savings balance (x2)	yuan	Resident savings balance/ Permanent population
3	Social fixed assets investment per capit(x3)	yuan	Social fixed assets invest /Permanent population
4	General budget fiscal income per capita (x4)	yuan	General budget fiscal income /Permanent population

Table 2 Economic development evaluation index system and corresponding data about Beijing's districts and counties

Districts	Per capita GDP （yuan）		Per capita resident savings balance （yuan）		Social fixed assets investment per capita （yuan）		Social fixed assets investment per capita（yuan）	
	2006	2009	2006	2009	2006	2009	2006	2009
New dongcheng	83511.95	129752.03	122513.57	209153.87	31689.33	33126.47	6430.95	10789.58
New xicheng	101186.98	145711.22	124182.33	173245.93	30024.61	18916.09	7594.09	15449.29
Chaoyang	49799.43	74878.31	58919.95	95016.85	31953.32	34755.55	3582.25	5923.70
Fengtai	25612.04	34413.61	53656.29	75801.62	16738.23	21356.61	1408.76	2148.76
Shijing Shan	38984.56	41101.02	43287.09	52311.75	13721.70	22532.93	1995.15	2972.43
Haidian	56680.93	79392.36	69678.60	101516.53	15094.43	15882.09	3271.62	5264.20
Mentougou	17742.96	26712.50	20539.32	37616.66	8182.19	30520.58	2618.70	3309.50
Shunyi	22361.33	32179.24	23013.97	38140.33	18029.16	38354.65	1311.43	2558.85
Fangshan	18217.80	25519.49	26151.61	40417.94	16041.65	28379.26	1596.76	2384.33
Tongzhou	40917.55	94286.78	27483.88	52955.32	24271.60	46978.31	3051.16	6573.88

Changping	27077.76	33534.24	28259.18	47104.38	20412.70	28451.55	2003.66	3096.36
Daxing	18527.69	23397.37	26687.80	44715.60	9582.15	30563.03	1358.68	1991.86
Huairou	30280.88	34589.74	23385.98	33926.62	19065.87	24550.54	2745.45	4333.55
Pinggu	15366.93	25054.89	16287.55	27896.52	9832.40	16543.35	1610.02	2875.06
Miyun county	19109.96	26098.34	17687.37	30114.86	13240.60	24617.77	1579.67	2822.47
Yanqing county	16391.01	21348.23	18494.49	28701.97	8859.60	16742.73	1370.73	2204.86
Beijing	50467.00	70452.00	55049.27	82996.49	21325.12	27683.22	3523.27	6046.86

Note: The original data are from Beijing area statistical yearbook in 2007 and 2010.

3. Evaluation Model

In the evaluation system, because the different types of data selected , units and magnitude of each index data are not often the same. so in the process of the comprehensive evaluation, First of all, it must eliminate the influence brought by different units and their numerical index of magnitude to avoid unreasonable phenomenon, Due to the different units and the difference among index numerical magnitude. So the evaluation indexes and dimensionless processing are needed, namely index standardization.

3.1. Indicators Consistency Method

The maximum value index, minimum value index, middle type index and interval type index are always included in the indicators system. Because the aim is to evaluate score of evaluation target, so we have to change the index into large extremely index by using the indicators consistency method.

Set index data x is not the maximum index from $\{x_i\}_{i=1}^{N}$, respectively, $\overline{x}, \underline{x}$ are the upper and lower bounds allowed, $[a,b]$ is x's better stability range. Through the following method, x will be change into extremely large index x':

(1) x is minimum value index:

$$x' = \overline{x} - x$$

(2) x is middle type index:

$$x' = \begin{cases} 2(x-\underline{x}) & \underline{x} \le x \le \frac{1}{2}(\overline{x}+\underline{x}) \\ 2(\overline{x}-x) & \frac{1}{2}(\overline{x}+\underline{x}) \le x \le \overline{x} \end{cases}$$

(3) x is interval type index:

$$x' = \begin{cases} 1.0 - \dfrac{a-x}{\max\{a-\underline{x}, \overline{x}-b\}} & x < a \\ 1.0 & x \in [a,b] \\ 1.0 - \dfrac{x-b}{\max\{a-\underline{x}, \overline{x}-b\}} & x > b \end{cases}$$

3.2. Index Dimensionless Processing Method

The so-called dimensionless, also known as standardization. It is a process eliminating the original index unit and impact produced by numerical magnitude through mathematics changes. So, a process of index dimensionless is that the actual value is changed into the evaluation index value which can be used .

Whether the dimensionless processing method used is linear function method, line function or curve function, depend on the relationship of the index actual value with evaluation value. So we have to specific analysis depend on specific circumstance . This is a linear function method, the calculation is as follows.

Hypothesis x is a actual value from data set $\{x_i\}_{i=1}^{N}$ consistence. x' is a evaluation value dealt with dimensionless processing. the linear function method of data processing is as follows:

$$x' = c + \frac{x - \min x}{\max x - \min x} d$$

c is a basic value of x and d is the largest positive value. After processed， the evaluation values range is $[c, c+d]$, evaluation value is increasing as the index increases, the minimum value for the index evaluation is basic numerical c. Maximum value is the basic value, pulsing the maximum bonus value d ,that is $c+d$.

Usually when calculating GDP indicator, in order to better describe the problem and highlight difference of the backward area, first of all, we have to take the logarithm of the original index, it can make the concave function into a convex function, and then we can used the linear function method of dimensionless.

3.3. Index Calculation

After dimensionless processing above， corresponding values of each index were assumed to be $x_1^{'}, x_2^{'}, x_3^{'}, x_4^{'}$. Each district economic development index is calculated as follows: $y = \sum_{i=1}^{4} x_i^{'} \Big/ 4$

4. Calculation Results and Analysis

The index data in Table 1 are processed by the use of above method. The results are shown in Table 3. We can see that the top 5 districts about economic development index in 2006 are New Xicheng District, New Dongcheng District, Chaoyang District, Haidian District and Shunyi District. While the top 5 districts in 2009 are New Xicheng District, New Dongcheng District, Shunyi District, Chaoyang District and Haidian District. In 2006 the last 5 districts or counties about the economic development index are Yanqing County, Pinggu District, Daxing District, Mentougou District and Miyun County. The last 5 districts or counties in 2009 are Yanqing County, Pinggu District, Miyun County, Daxing District and Tongzhou District.

From 2006 to 2009, economic index rank of 6 areas out of 16 districts and counties in Beijing rose, they are respectively New Dongcheng District, Mentougou District, Fangshan District, Shunyi District, Changping District, Daxing District. And economic index rank of 8 areas out of 16 districts and counties in Beijing dropped, they are respectively New Xicheng District, Chaoyang District, Fengtai District, Shijingshan District, Haidian District, Tongzhou District, Huairou District and Miyun County. The biggest variation District is Fangshan. The smallest variation are Pinggu District and Yanqing County, they don't change.

Table 3 Economic development index about the districts and counties of Beijing in 2006 and 2009

Serial number	Districts	Economic Index in 2006	Rank	Economic Index in 2009	Rank
1	New Dongcheng	96.86	2	91.63	1
2	New Xicheng	99.31	1	86.02	2
3	Chaoyang	82.43	3	77.74	4
4	Fengtai	61.36	9	55.82	11
5	Shijingshan	63.90	6	57.57	8
6	Haidian	75.67	4	66.99	5
7	Mentougou	48.76	13	56.73	10
8	Fangshan	54.24	10	59.56	6
9	Tongzhou	53.94	11	53.50	12
10	Shunyi	70.84	5	80.12	3
11	Changping	62.26	8	58.72	7
12	Daxing	47.18	14	53.28	13

13	Huairou	63.69	7	56.94	9
14	Pinggu	43.77	15	44.50	15
15	Miyun	49.23	12	50.75	14
16	Yanqing	42.71	16	41.69	16
The whole city		77.34		73.12	

5. Conclusions

5.1. The economic development of Beijing's districts and counties changed a little during the eleventh five-year period.

Overall, the economic development rank changed a little in Beijing's districts and counties from 2006 to 2009.The top five areas about economic development index in 2006 are still the same in 2009, except changes in sequence. The last five areas about economic development index in 2006 are the same in 2009 except Mentougou.

5.2. The economic development growth in Fangshan District is the highest during the eleventh five-year period.

According to the economic development index, we can see that Fangshan District changed a lot, ranking place from 10th in 2006 up to 6th in 2009. From 2005, Fangshan district begins to modify the industrial structure, which turns coals, mining resource industry into tourism, trade, cultural and creative industries of new economic growth mode. Recent years, Fangshan District puts great efforts into investment. Per capita social fixed asset investment reaches 38354.65 RMB(second place among the 16 districts of Beijing)to ensure the GDP and financial revenue growth and help the economic rapid development.

5.3. The economic development growth is slower in outer suburb districts of Beijing during the eleventh five-year period.

Depending on the economic development index, we can see that the last five are mainly outer suburb districts either in 2006 or 2009. In addition, Yanqing county and Pinggu district never changed since 2006 to 2009. What mentioned above states that the main districts are in steady growth but the outer suburb districts need more modification of industrial structure and find new economic growth mode.

5.4. The outer suburb district of Shunyi develop fast during the eleventh five-year period.

On the basis of the economic development index, Shunyi district ranked from top five up to top three since 2006 to 2009 in advance of Chaoyang and Haidian district. The per capita GDP growth rate is at the top among all the districts in Beijing from 2006 to 2009, reaching 32.08% .The development in Shunyi district present more support. Air-related economy begins to take shape. Modern manufacturing develop fast. Air economic zone is considered as one of the six most important high end industrial zones. Shunyi district takes full advantage of the international airport resource to develop an airport industrial cluster which includes many parts, aviation, logistics and high technology industries as main body; cars, electrommunication and equipment manufacturing industries as key point; exhibition, business, finance and intermediary such modern survive as support; airport development zone, Tianzhu export processing zone, airport logistics base, Linhe economic development zone, auto production base, international business district as the platform. Shunyi district becomes an economic improvement engine and an important pole of capital economic development .

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