

# Evaluation of the Level of Public Cultural Investment: A Case Study of the Beijing-Tianjin-Hebei City Cluster

Boxin Zhao<sup>a</sup>, Jin Duan<sup>b</sup>, Xingyu Wei<sup>c</sup> and Tszen•Balmo<sup>d</sup>

School of public management, Tianjin university of commerce, Tianjin, China

<sup>a</sup>zhaoboxin@stu.tjcu.edu.cn, <sup>b</sup>duanjin@stu.tjcu.edu.cn,

<sup>c</sup>weixingyu@stu.tjcu.edu.cn, <sup>d</sup>caizengbamao@stu.tjcu.edu.cn

## Abstract

The government's public cultural investment is an important way to realize the socialist cultural power and an important measure of people's happiness index. Public cultural investment has become an important point to promote the transformation of economic structure and expand domestic demand in China. Taking the Beijing-Tianjin-Hebei city cluster as an example, this paper constructs a public cultural investment index system, and on this basis, adopts a multi-indicator panel data model to study the level of public cultural investment in each city of the Beijing-Tianjin-Hebei city cluster. The results show that:(1)the absolute level of public cultural investment in the Beijing-Tianjin-Hebei city cluster is generally poor, the incremental level is generally good, the fluctuation level is generally normal, and the development within the region is unbalanced.(2)The level of public cultural investment in the Beijing-Tianjin-Hebei city cluster shows an upward trend, and the overall evaluation is "good". According to the evaluation results of the level of regional public cultural investment, specific suggestions are given.

## Keywords

Public cultural investment; Level evaluation; The Beijing-Tianjin-Hebei city cluster.

## 1. INTRODUCTION

Culture is an important embodiment of a country's soft power. As an emerging culture, public culture plays an increasingly important role in national social life as China's economy shifts from a stage of high-speed growth to a stage of high-quality development. In the report of the 20th National Congress of the Communist Party of China, it was proposed to "promote cultural self-confidence and self-improvement, and cast new brilliant socialist culture." The government's public cultural investment is an important guarantee to realize and protect the people's basic cultural rights and interests, an important way to build a socialist cultural power, and an important yardstick to measure people's happiness index[1].

The increase of public cultural investment not only brings the increase of the number of public cultural facilities and the improvement of the efficiency of public cultural services, but also can indirectly promote the growth of regional economy. Investment in public cultural services is conducive to improving the technical level of workers and internalizing them into stable and orderly behavioral norms and moral concepts, and building a good social relationship network, which is conducive to creating human resources and external environment for economic development. Therefore, how to conduct a comprehensive, scientific and accurate evaluation of public cultural investment in the Beijing-Tianjin-Hebei city cluster,

and then analyze its internal influencing factors, and seek the optimal path of public cultural investment has important practical significance.

Based on the relevant data of public cultural investment in the Beijing-Tianjin-Hebei City cluster from 2013 to 2020, this paper proposes an index system that accords with the characteristics of public cultural investment. On this basis, a multi-indicator panel data model is constructed to study the level of public cultural investment in various cities in the Beijing-Tianjin-Hebei city cluster.

## 2. EVALUATION METHODOLOGY

In the research of panel data, single-indicator panel data is difficult to fully reflect the features due to the small amount of information, while multi-indicator panel data can fully reflect the features of panel data. There are few studies on this in foreign countries. Chinese scholar Zheng[2] used to transition from single-indicator panel data to multi-indicator panel data, and conducted empirical analysis on multi-indicator panel data. On this basis, Ren[3] established horizontal indicators, incremental indicators and incremental change rate indicators and proposed a clustering method. Dang & Hou[4] studied the clustering of "absolute quantity", "fluctuation", "skewness", "kurtosis" and "trend" characteristics. Li & He[5] comprehensively reflected the dynamic changes among individuals through three statistical indicators: absolute quantity, growth rate and coefficient of variation among samples. In view of this, the characteristics of "absolute quantity", "increment" and "fluctuation" are adopted to reflect the level of public cultural investment in the Beijing-Tianjin-Hebei city cluster.

On the basis of absorbing and referring to the existing research results, this paper measures the level of public cultural investment in various cities in the Beijing-Tianjin-Hebei city cluster at three levels: absolute level, incremental level and fluctuation level, so as to reflect the development status of public cultural investment in various cities from different aspects.

The absolute quantity level represents the comprehensive evaluation of the original data and reflects the development status of its research object in a period of time. The higher the overall score of absolute quantity level, the better the performance of the evaluated object. The increment level represents the performance of the growth rate of each evaluated object over a period of time, and reflects the growth rate of each index of the research object in each period. The higher the overall score of increment level, the faster the growth rate of the evaluated object. The fluctuation level represents the variation coefficient of the evaluated object in T time, and reflects the fluctuation degree of each index of the evaluated object over time, that is, the stability of the evaluated object. Therefore, the smaller the comprehensive score of the volatility level, the smaller the difference between the evaluated objects in different times, that is, the more stable the development.

## 3. MEASURE THE LEVEL OF PUBLIC CULTURAL INVESTMENT IN THE CITIES OF BEIJING-TIANJIN-HEBEI CITY GROUP

### 3.1. Establishment of index system

The construction of the evaluation index system is based on the principles of scientific, comparable, systematic, targeted and practical construction, and takes into account relevant index systems such as the Report on the Development of China's Cultural Industry and the National Guiding Standards for Basic Public Cultural Services (2015-2020). In addition, based on the index system construction of scholars such as Wang Lin[6] and Wang Yicheng[7], and combined with the current situation of the Beijing-Tianjin-Hebei city cluster, the index system of public cultural investment evaluation of the Beijing-Tianjin-Hebei city cluster is proposed.

The level of public cultural investment in the Beijing-Tianjin-Hebei region is divided into five categories: government input, resource supply, marketization degree, economic benefit and cultural output, and is subdivided into eight indicators and recorded as a1, a2,..., a8. The general situation of the index system proposed in this paper is shown in Table 1.

**Table 1.** Evaluation index system of public cultural investment in the Beijing-Tianjin-Hebei city cluster

Evaluation Content	Indicator layer	Indicator name
<b>Government input</b>	Expenditure a1	Expenditure on cultural undertakings
	Cultural expenditure a2	Fixed assets Investment
<b>resource supply</b>	Number of institutions a3	Public cultural institutions
<b>marketization degree</b>	Manpower input a4	Number of employees in the cultural industry
	consumption a5	Per capita expenditure on cultural tourism consumption
<b>economic benefit</b>	Cultural Added value a6	Value added of the cultural industry
<b>cultural output</b>	Library collection a7	Total library holdings
	Group art activities a8	The number of mass art activities

### 3.2. Data sources

Combined with the evaluation index system, this paper selects the panel data of the Beijing-Tianjin-Hebei urban agglomeration from 2013 to 2020 to evaluate the public cultural investment in the Beijing-Tianjin-Hebei urban agglomeration. The data comes from China City Statistical Yearbook, Hebei Statistical Yearbook, various city statistical Yearbook, and relevant communiques and statistical data published by government departments.

### 3.3. Multi-indicator panel data to measure the level of public cultural investment in various cities in the Beijing-Tianjin-Hebei city cluster

#### (1) Absolute quantity level measurement

In this paper, the absolute volume level matrix is used to bring the original data into the matrix. First, the data is standardized by the extreme value standardization method, and the weight is calculated by the entropy method to obtain the comprehensive score of the absolute volume of public cultural investment in the cities of the Beijing-Tianjin-Hebei urban agglomeration from 2013 to 2020. As shown in Table 3-2, Beijing (6.09), Tianjin (2.37) and Shijiazhuang (1.00) have the highest absolute comprehensive scores, while Hengshui (0.18) has the lowest absolute comprehensive scores. Therefore, the comprehensive score of absolute quantity shows that there is a large gap between cities. The main reason for the large gap is that large cities have developed economic foundation, occupy a large advantage in infrastructure, talent development and related welfare policies, and attract a large number of outstanding talents and enterprises to develop and invest in culture, thus promoting the improvement of the level of public cultural investment, while small cities do the opposite.

#### (2) Incremental level measurement

In this paper, the absolute quantity level matrix is used to bring the original data into the matrix. First, the data is standardized by the extreme value standardization method, and the weight is calculated by the entropy method to obtain the comprehensive score of the absolute quantity of public cultural investment in the cities of the Beijing-Tianjin-Hebei urban agglomeration from 2013 to 2020.

As can be seen from Table 3-2, Hengshui (4.65), Qinhuangdao (4.64) and Cangzhou (4.62) are the cities with the highest comprehensive score of incremental level, while Tianjin (4.06) is the city with the lowest comprehensive score of incremental level. The incremental level reflects the growth rate of a city over a period of time, and it can be seen from the figure that there is not much difference between cities in the comprehensive score of the incremental level. This result is partly due to the problem of index weight, and partly due to the fact that small cities have more potential in terms of increment, while large cities such as Tianjin show a downward trend due to many factors such as structural transformation in recent years.

### (3) Measurement of the fluctuation level

In this paper, the incremental level matrix is used to obtain the incremental level matrix by data operation on each index of the original data, and the weight is calculated by entropy method to obtain the comprehensive score of the incremental public cultural investment of each city in the Beijing-Tianjin-Hebei urban agglomeration from 2013 to 2020.

As shown in Table 2, Beijing (0.01), Tianjin (0.11) and Shijiazhuang (0.14) are the cities with low comprehensive scores of fluctuation level, while Hengshui (0.84) is the city with high comprehensive scores of increment level. The volatility level reflects the stability of a city over a period of time, and the lower the volatility level score, the better the performance of the city over a period of time. As can be seen from the figure, there is a large gap between cities in the comprehensive score of the volatility level, which may be due to the fact that large cities have strong self-development ability, while small cities have weak self-development ability and poor stability.

**Table 2.** Level of public cultural investment in the Beijing-Tianjin-Hebei city cluster

Urban	Absolute volume comprehensive score	Increment comprehensive score	Fluctuation level comprehensive score
<b>Beijing</b>	6.089	4.122	0.010
<b>Tianjin</b>	2.370	4.061	0.110
<b>Shijiazhuang</b>	1.001	4.253	0.140
<b>Chengde</b>	0.643	4.406	0.287
<b>Tangshan</b>	0.612	4.450	0.219
<b>Zhangjiakou</b>	0.533	4.354	0.244
<b>Handan</b>	0.498	4.365	0.231
<b>Baoding</b>	0.492	4.314	0.277
<b>Cangzhou</b>	0.444	4.616	0.295
<b>Qinhuangdao</b>	0.428	4.637	0.350
<b>Langfang</b>	0.303	4.411	0.769
<b>Xingtai</b>	0.263	4.520	0.450
<b>Hengshui</b>	0.184	4.645	0.837

### 3.4. K-means clustering analysis

In this paper, K-means cluster analysis method is used to classify the absolute quantitative comprehensive score, incremental comprehensive score and fluctuation comprehensive score after standardization, that is, the data is divided into K groups, then K objects are randomly selected as the initial cluster center, and the optimal cluster center is finally obtained through continuous iteration. The absolute quantity level is divided into three categories: good, general and poor. The increment level is divided into fast, average and slow. The fluctuation level is divided into good, average and poor. The following clustering centers are obtained:

absolute volume level (1, 0.118, 0.024)

Incremental level (0.864, 0.434, 0.104)

Fluctuation level (1, 0.752, 0.359)

### 3.5. Evaluation of the level of public cultural investment in the Beijing-Tianjin-Hebei city cluster by city

According to the cluster center, the following evaluation of the incremental level, absolute level and fluctuation level of public cultural investment in the Beijing-Tianjin-Hebei city cluster is obtained. As can be seen from Table 3, the only city rated as "good" in absolute quantity level is Beijing; Cities rated as "average" include Tianjin, Tangshan, Shijiazhuang and Chengde; Eight cities were rated "poor." It shows that the absolute level of the Beijing-Tianjin-Hebei urban agglomeration is generally low. There are 5 cities in Tangshan, Qinhuangdao, Cangzhou, Hengshui and Xingtai that are rated as "fast", 6 cities that are rated as "average" and 2 cities that are rated as "slow", indicating that the incremental level of the Beijing-Tianjin-Hebei urban agglomeration is generally good, but it can also be seen that the absolute volume level of the cities with a faster incremental level is lower. Beijing and Tianjin are rated as "good" in terms of volatility level, 8 cities are rated as "average", and 3 cities are rated as "poor". It can be seen that the volatility level of the Beijing-Tianjin-Hebei urban agglomeration is generally average, and most cities with poor absolute volume level are also poor in terms of volatility level.

**Table 3.** Level of public cultural investment in the Beijing-Tianjin-Hebei city cluster

Urban	Absolute volume comprehensive score	Increment comprehensive score	Fluctuation level comprehensive score
<b>Beijing</b>	good	slow	good
<b>Tianjin</b>	general	slow	good
<b>Shijiazhuang</b>	general	average	general
<b>Chengde</b>	general	average	general
<b>Tangshan</b>	general	quick	general
<b>Zhangjiakou</b>	general	average	general
<b>Handan</b>	difference	average	general
<b>Baoding</b>	difference	average	general
<b>Cangzhou</b>	difference	quick	general
<b>Qinhuangdao</b>	difference	quick	general
<b>Langfang</b>	difference	average	general
<b>Xingtai</b>	difference	quick	general
<b>Hengshui</b>	difference	quick	difference

## 4. CONCLUSION AND SUGGESTION

This paper mainly studies the level of public cultural investment in the Beijing-Tianjin-Hebei city cluster. The absolute volume level, increment level and fluctuation level of all cities in the Beijing-Tianjin-Hebei urban agglomeration were analyzed through the absolute volume matrix, increment matrix and fluctuation matrix, and the cluster center was obtained through the cluster analysis, and the absolute volume level, increment level and fluctuation level of public cultural investment of all cities in the Beijing-Tianjin-Hebei urban agglomeration were evaluated by reference. It is found that the absolute quantity level of the evaluation is "good" only in Beijing, most of the evaluation is "average" or "poor", the absolute quantity level is generally poor; The increment level of cities rated as "fast" or "average" accounted for most of them, and the increment level of cities with poor absolute volume level was generally better.

The fluctuation level of the cities evaluated as "good" are Beijing and Tianjin, most of the evaluation is "general", the overall fluctuation level is general, and it is found that the absolute level of the city is poor, most of the fluctuation level is poor. Therefore, the following suggestions are put forward:

(1) Improving the scale of public cultural investment. According to the conclusion, the absolute level of the Beijing-Tianjin-Hebei urban agglomeration is still not ideal, which also reflects that the growth of the scale of public cultural investment in the Beijing-Tianjin-Hebei urban agglomeration still has great potential. The Beijing-Tianjin-Hebei city cluster should give full play to the advantages of urban resources, give play to the role of the market in the effective allocation of cultural industry resources, further expand the scale of the cultural industry market, on this basis, improve the public cultural output and improve the efficiency of public cultural investment, so as to enhance the scale of public cultural investment.

(2) Optimizing resource allocation and focusing on regional coordinated development. According to the conclusion, the development level of public cultural investment among cities in the Beijing-Tianjin-Hebei city cluster is unbalanced, which is likely to further lead to the lack of impetus for coordinated development among cities. Interregional latecomer cities should give full play to local cultural advantages, expand cultural market and enhance cultural competitiveness. In particular, with Beijing, Tianjin and Shijiazhuang as the center, we will lead neighboring cities to promote the complementarity of urban strengths and weaknesses, relocate cutting-edge technologies, cultural facilities and human resources to appropriate locations, and deepen the cultural specialization among regions. It is necessary to promote the building of a collaborative innovation community, break down cultural market barriers within urban agglomerations, dredge the channel for the allocation of cultural elements between regions, and promote cross-regional cultural integration. At the same time, advanced cities should drive late-developing cities to achieve balanced development of public cultural investment among urban agglomerations.

(3) Innovating traditional concepts and improving cultural and scientific capabilities. Innovation is the primary driving force for development. With the socialist modernization, digital technology has brought revolutionary changes to the cultural industry and has become a new driving force for the development of the current cultural industry. The government should keep pace with The Times, innovate traditional cultural concepts, and increase investment in the research and development of culture and science and technology. It should not only introduce advanced technology and independent innovation and research and development, but also establish a communication mechanism for the integration of culture and science and technology, provide effective technical support for the cultural industry, and empower the cultural industry with science and technology, so as to improve the level of public cultural investment in the Beijing-Tianjin-Hebei city cluster.

## ACKNOWLEDGEMENTS

This paper was supported by my supervisor, I would like to sincerely thank my supervisor, whose advice and encouragement enabled me to have a deeper understanding of these studies. Studying under his guidance and supervision is my great honor and joy. In addition, I am honored to have benefited from his personality and diligence, which I will cherish all my life. I can't thank him enough.

## REFERENCES

- [1] Zhao Yingfang: The strategic choice of the construction of chinese culture and people's livelihood in the new era, Journal of Dongyue, Vol. 40 (2019) No.4, p.12-20.

- [2] Zheng Bingyun: Cluster analysis of multi-index panel data and its application, *Mathematical Statistics and Management*, Vol. 23 (2008) No.2, p.265-270.
- [3] Ren Juan: Multi-index panel data clustering method and its application, *Statistics and Decision*, Vol. 28 (2012) No.4, p.92-95.
- [4] Dang Yaoguo, Hou Diqing: Multi-index panel data clustering method based on feature extraction, *Statistics and Decision*, Vol. 32(2016) No.19, p.68-72.
- [5] Li Yingguo, He Xiaoqun: Panel data clustering method and its application, *Statistical research*, Vol. 27 (2019) No.9, p.73-79.
- [6] Information on: <http://www.china.com.cn/ch-whcy/5.htm>.
- [7] Wang Yicheng: Urban Cultural modernization Index System and its Evaluation, *Economic Geography*, Vol. 23 (2003) No.2, p.230-232.