Studying the Basic Public Services' Equilibrium: an Empirical Analysis Using Sichuan Municipal Panel Data

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Abstract. Strengthening the social public service system is a crucial measure in ensuring and enhancing people's livelihood. Studying the temporal and spatial evolution of public services during the 13th Five-Year Plan period is of great practical significance for the national and local governments to further enhance the policy system of public services. Using panel data from 21 cities of Sichuan Province, analysis techniques including entropy weight TOPSIS were used to examine the temporal and spatial evolution of the province's basic public service level. The results showed that during the "13th Five-Year Plan" period, Sichuan Province's basic public service level increased steadily, although there were wide disparities between regions and the overall trend showed expansion and bipolarization.

Keywords: basic public services, public service equalization, entropy weight TOPSIS

1. Introduction

Building up the social public service system is essential to improving people's well-being and ensuring and improving their livelihood [1]. At the national level, a series of documents such as the 14th Five-Year Plan for Public Services and the National Basic Public Service Standards (2021 Edition) have been promulgated, and local governments have also put forward their own 14th Five-Year Plans according to their own characteristics. An important objective of public services mentioned in national and provincial plans is the equalization of basic public services (BPS), meaning that basic public services should meet all people's needs for survival and development. This is also a key objective of the "13th Five-Year Plan". Basic public services include social security, basic education, medical security, and public cultural services. In western provinces such as Sichuan, where development is unbalanced and inadequate, the improvement of BPS is essential to promoting social equity and justice, as well as improving the well-being of people [2]. This study attempted to research the level of BPS in Sichuan Province, using panel data from 21 cities in Sichuan Province In order to analyze public service level in Sichuan Province in the temporal and spatial dimensions， the BPS level in Sichuan Province during the 13th Five-Year Plan period was evaluated by the method of entropy weight TOPSIS quantification. On this basis, the implementation path and countermeasures for improving public service capacity in Sichuan Province were put forward, which can serve as a reference for national and local governments to further enhance public service policy.

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2. Literature review

There are still some differences in the interpretation of the concept and scope of public services [3], and the concept of BPS has Chinese characteristics [4]. Its cognition and definition is a gradually clear process from inside to outside. The BPS comes from the theory of public goods, that is, participants can enjoy the utility that is completely equivalent to the payer without cost, which will lead to unfair distribution of the supply cost of the item. The purpose of the public goods theory to divide product categories is to pursue resource allocation optimization and play the role of the government and the market in a targeted manner according to the nature of different products. The goal of public goods is that each member has fair access to resources and opportunities [5]. Therefore, it is defined as "each person's consumption of the good does not reduce the consumption of others" [6]. In the research of public goods, if economic goods are classified according to Samuelson's dichotomy, they can be divided into pure private goods and pure public goods. Some scholars believes that this classification method is too absolute, and some goods are between pure public goods and pure private goods, so they expands the classification method into three categories and adds a class of quasi-public goods. Basic public service is a government function in China, which refers to ensuring that all citizens receive the most basic life services, and there are many definitions of the scope included. The "14th Five-Year" Public Service Plan defined the scope of BPS as including public education, social security, public culture and sports, public medical care. Based on the definition above, basic public services was defined in this study as five aspects: basic medical care, basic public education, basic social security, science and technology, and basic public cultural and sports services.

When it comes to measuring the BPS level, there have been relatively rich research results, and there are many evaluation methods [7]. Among the above methods, determining the index system for evaluation is the most important task. Although scholars have some differences in the selection of the evaluation index system from different perspectives, the index design generally revolves around the scope of BPS. , such as (Li Hua 2018) [8] at the national and provincial levels through education, public security, social security employment, science and technology, public culture, infrastructure, environmental protection, medical and health 8 dimensions 21 indicators to build the basic public service supply level. (Xiong Xing 2018) [9] established 27 index systems in 8 aspects of public transportation, information, infrastructure, basic education, culture, medical care, social security, and environmental protection through literature review, and they used the method of entropy weight TOPSIS measured the level of BPS in China from 2011 to 2014. Many scholars have also conducted research on the equalization of basic public services. Jia Kang [10] divided the hierarchy of basic public services in the literature, and believed that the equality of basic public services should be considered from the three levels of region, urban and rural areas, and individuals, and priority should be given to regional equality in these three levels sexual issues. In terms of evaluation and measurement of equality, there are mainly two types of measurement methods. One is to judge from the perspective of spatial aggregation, including exploratory spatial data analysis (ESDA) [9] [10]. For example (Zhou Xiaogang et al. 2021) [11] analyzed the level of coordination between China's basic public services in different regions and the economy through Moran's I index, and believed that China's basic public services are closely related to the level of economic growth in different regions. (Han Zenglin et al. 2015) [12] analyzed the spatial differentiation

characteristics of China's urban and rural areas and found that China's BPS have obvious gaps between different regions. The second is to use index calculation methods, such as Theil index and Gini coefficient method [13]. For example, some scholars measure the degree of equalization of China's basic public services through the Dagum Gini index, as the basis for the next step of spatial decomposition. To sum up, there have been many studies examining the measurement and equalization of basic public service levels, however, the majority of these studies focus on the provincial level, while there are few studies at the city level, which requires further investigation.

3. Index System

Based on reviewing the literature, this study will start from the connotation and essence of BPS and construct an evaluation index system that can objectively reflect basic public services. Based on the definition and measurement indexes of BPS in the literature review, five first-level evaluation dimensions were constructed: basic medical care, basic public education, basic social security, science and technology, and basic public cultural and sports services. We refer to the "13th Five-Year Plan for Public Service of Sichuan Province", "14th Five-Year Plan for Public Service of Sichuan Province", "National Basic Public Service Standards", "Strengthening the Construction of Social Public Service Security Level" and other documents to select appropriate secondary indicators, and finally formed a three-level comprehensive public service index system (Table 1). To objectively, comprehensively and scientifically reflect the comprehensive level of BPS in 21 cities in Sichuan Province during the 13th Five-Year Plan period.

Table 1 Index of Basic Public Services

Category	indicators	Indicator number	attribute	Unit
Basic public education	Number of schools per 100 square kilometers	x1	+	unit
	Teacher-student ratio in primary and secondary schools (number of students = 1)	x2	+	/
Basic medical care	Number of hospitals per 100 square kilometers	x3	+	unit
	Number of primary medical institutions per 100 square kilometers	x4	+	unit
	Number of beds in health facilities per 1,000 people	x5	+	unit
	Number of health technicians per 1,000 population	x6	+	unit
Basic social security	The collection rate of basic old-age insurance for urban employees	x7	+	%
	Basic medical insurance collection rate	x8	+	%

	Work-related injury insurance characterizes the contribution rate	x9	+	%
	Maternity insurance collection rate	x10	+	%
Science and technology	R&D expenditure per 1,000 people	x11	+	Yuan
	Number of scientific research institutions per capita	x12	+	unit
	Number of R&D researchers per capita	x13	+	unit
Basic public cultural services	Number of public library institutions	x18	+	unit
	Number of cultural centers	x19	+	unit
	人 The number of households using cable broadcasting	x20	+	unit

4. Research Methods

The research measured the degree of fundamental public service in Sichuan Province through the joint evaluation method of Entropy Weight and TOPSIS method. The merit of entropy-weighted TOPSIS for objectively evaluating objects is often used in measures of the overall level of things. Specifically, the entropy tackle is used in this study to calculate the weight of each index coefficient, and the entropy of the information represented in the sample evaluates the uncertainty of the information reflected by the index in the sample. Indicators with high information have low entropy values, and indicators with low information have high entropy values. The indicator used in this study is panel data, so it is more suitable for this objective empowerment method. Entropy values and preprocessed data are used to weight, forming a new weighted matrix. The weighted matrix was measured by TOPSIS and sorted according to the closeness, and the final evaluation results were obtained. The calculation steps and formulas are as follows.

5. Empirical Analysis

The panel data in this study are mostly drawn from the Sichuan Statistical Yearbook (2016-2021), and in the calculation process, due to the yearbook's sometimes-absent data, the data filling method is appropriately supplemented. When the missing data is numeric, it is filled in using the mean or median method.

5.1 Trend of BPS by times

From the perspective of time dimension, during the 13th Five-Year Plan period, the comprehensive level of BPS in Sichuan Province increased year by year (Figure 1), especially the fold line in 2019 and 2020 was significantly moved upward, and the overall comprehensive

level improved significantly. From 2016 to 2018, although there was also improvement, the improvement span was not large, and the polyline was relatively close. During the 13th Five-Year Plan period, Sichuan Province achieved good results in level of BPS, and the comprehensive implementation effect was remarkable. The investment in public services continued to increase, BPS continued to increase to rural and remote mountainous areas, especially in basic social security, the comprehensive level of BPS in Sichuan Province remained stable, and in 2020, due to changes in statistical caliber, the level of universal services decreased slightly compared with the previous period.

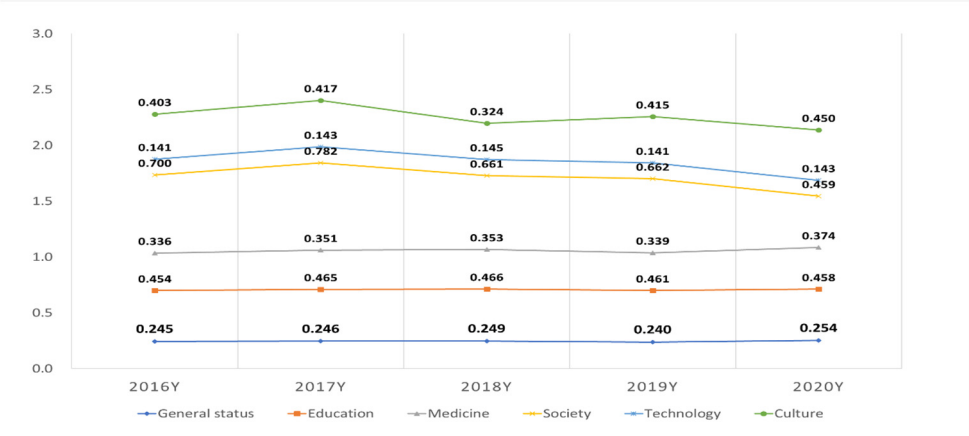

Figure 1 Trend of BPS from 2016 to 2020

5.2 Regional trends in the availability of BPS

According to the division of Sichuan Province's economic geographical regional planning, Sichuan Province is split into five major economic zones. The Chengdu Plain Economic Zone, including Chengdu city, Deyang city, Mianyang city, Meishan city, Leshan city, Ziyang city, Suining city and Ya'an city. The South Sichuan Economic Zone includes four prefecture-level cities: Zigong City, Luzhou City, Neijiang City and Yibin City. The Northeast Sichuan Economic Zone includes Nanchong city, Dazhou city, Guang'an city, Guangyuan city and Bazhong city. Panxi Economic Zone, including Panzhihua City and Xichang City. The Northwest Sichuan Ecological Demonstration Zone refers to Aba Prefecture and Kardze Prefecture located in the northwest region of Sichuan Province, with the central cities of Malkang City and Kangding City respectively. Figure 2 shows the relative advantages and disadvantages of level of BPS in the five major economic regions of Sichuan Province in 2016~2020 at the overall level and in different dimensions. From a comprehensive point of view, the Chengdu Plain District has the highest level of BPS, while the level of the West Sichuan Economic Zone is lower, and the five economic divisions are significant. From the perspective of education, the level of Chengdu Plain, South Sichuan and East Sichuan is close, while the Panxi area has the lowest level.

Figure 2 Trends in the level of BPS by region during 2016 to 2020

6. Conclusions and discussions

(1) Further strengthen the equalization of BPS. When the per capita and local average consideration of the input level and output level of public services, input efficiency, the indices of all prefectures, cities and prefectures in Sichuan Province fluctuated greatly, and Sichuan Province's ranking in the national public service index also declined, indicating that the BPS in

Sichuan Province still faces the challenge of large administrative area and weak historical investment base. Especially for some municipalities with influx areas, the influx of non-resident people will further exacerbate the situation, resulting in low levels of output of BPS. As a result, the policy of equalization of public services should be maintained, and the tilt of public services towards non-residents should be intensified.

(2) Build a public service community. Through the experience summary of demonstration cities, guide high-quality public service resources to sink into other cities, promote co-construction and sharing between cities, and improve the efficiency of BPS. Promote unified planning of public services in the province and put the strategy into action as a whole.

(3) Strengthen the application of technological innovation in the field of BPS. Build a public service system based on the "Internet," and generally increase the efficiency and integration of BPS through data exchange across prefectures, cities and prefectures, governments, the general public, and public service corporations.

(4) Integrate public services with the key strategies of Sichuan Province. China is facing new challenges such as continuous demographic changes and further aging of the population. During the “14th Five-Year Plan”, inter-city economic exchanges became more frequent, the trend of miniaturization of households was obvious, and the movement of people became more frequent. As a province with a large population, Sichuan will be more prominent than other provinces because of its large population base. Therefore, public services need to promote long-term balanced population development as one of the goals, take public services as an important support, closely integrate with the key strategies of Sichuan Province, and play an important supporting role.

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