Research Article

Supply Gap of Urban and Rural Public Goods Based on Big Data Mining Technology

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The issue of the supply gap of public goods (PG) between urban and rural (UR) areas is a subject of great socio-economic significance and practical research value. To a large extent, it is related to the smooth progress of my country’s socialist market economy. The gap between the supply and demand of UR PG can be well analyzed by applying data mining (DM) technology in the era of big data. Due to the unbalanced supply of UR PG, this paper studies the distribution gap of UR PG through DM. This article mainly uses experimental, comparative, and survey methods to compare and analyze the urban-rural income gap and uses modern technology to describe the relationship between the supply of PG and income. Experimental results show that the UR income gap ratio is above 2, and the gap is still large. Therefore, for the supply of PG, there are also certain differences between UR areas.

1. Introduction

The issue of the supply gap between UR PG has always been an important problem facing my country’s economic development. In the context of the era of big data, how to effectively solve this problem has become a topic of widespread concern from all walks of life. Under such circumstances, the government needs to take measures to manage, guide, and regulate the market order in a reasonable and effective manner.

There are many research theoretical results based on the analysis of the gap between UR PG supply based on big DM technology. For example, some people have proposed that the difference in the supply of rural PG is the main manifestation of the regional differentiation of rural public services (PS) [1, 2]. Others believe that the factors affecting the supply of rural PG are analyzed from the four levels of individuals, families, villages, and regions above the village level [3, 4]. In addition, some people said that local public products are connected with national public products and have characteristics that other types of public products do not have [5, 6]. Therefore, this article intends to use DM technology to analyze the gap between UR PG and provide solutions to narrow the gap between UR areas.

This article first studies the basic theory of PG. Second, it analyzes the current situation of education and medical PG supply. Then, the supply mechanism is described in detail. Afterwards, it analyzes the urban-rural income gap and its impact on supply. Then, DM technology is used to briefly summarize the relationship between the income gap and the supply of PG. Finally, through investigations and experiments, statistics and descriptions of relevant data are carried out.

2. Analysis of the Gap between Urban and Rural Public Goods Supply Based on Big Data Mining Technology

2.1. Public Goods. We know that although the concept of PG is widely used in economics, it is really difficult to give an accurate definition of PG because PG includes a wide variety of different public goods with huge differences in supply characteristics.

Some researchers believe that there are two types of public products: “One is a central public product, that is, a basic public service that can only be provided and produced by the state.” The other is a mixed public product shared by the private sector and a municipal infrastructure. Semi-PS is
provided by nongovernmental organizations such as facilities and public utility companies. PG is bound to the corresponding supply station [7, 8].

2.1.1. The Horizontal Dimension of PG. From a horizontal perspective, PG at the same level is not unique, but diverse. Such PG requires the administrative subject to be given compulsory public powers. Basic public products mainly involve public infrastructure projects. Social security, disease prevention, and other public products are guaranteed. In the horizontal division of diversified public products, the supply channels of various public products are reviewed, and the responsibilities of relevant procurement agencies [9, 10] are clarified.

2.1.2. Influencing Factors. There are many factors influencing the supply of PG in UR. On the whole, the reduction of rural population, the increase of urban population, and the acceleration of urbanization have had a great impact on the demand for public services. At the same time, the growth rate of urban residents’ income is significantly higher than that of rural residents, and its growth rate is lower than the national average trend of development. From the current development of China, although many regions have begun to use big data technology to improve PS level, however, due to its own conditions and insufficient government investment, some places have not received enough attention and cannot be resolved in a timely and effective manner. There is a positive correlation between the total demand for PS and the urbanization rate [11, 12].

2.2. Status Quo of the Supply of Education and Medical PG. In recent years, the federal government and all sectors of society have begun to attach great importance to the “three rural” issues. In this context, my country’s rural education has also ushered in a very precious development opportunity. The Communist Party of China and the Chinese government have gradually promoted rural education in their policies. Capital investment and resource use have been deepened in all aspects, but at the same time, we must clearly see that rural education is generally doing well. Due to the differences in economic development in different regions and the imbalance of educational resources, there are significant differences in the supply of PG in my country’s UR areas.

This paper uses the gap between UR education expenditures to measure the difference in the supply of public education goods between UR areas.

The average value of the gap between UR education funding in all provinces across the country has gradually increased with the increase of the year.

Generally speaking, the difference in public education between coastal cities and rural areas is relatively small, while the difference in public education between coastal cities with good economic development and education and inland rural areas is generally larger.

In recent years, the Chinese government has vigorously built and improved the public health system and has officially made medical reform an important part of deepening the reform. Let the whole people “see a doctor” and let the doctor not be ashamed—this is an important goal of the balanced development of our society and economy. However, in our country, just like the supply of UR public education products, with the acceleration of urbanization, there are obvious urban-rural differences in the supply of medical public products.

The gap in the supply of PG between UR areas has a huge impact on my country’s economic growth. The first is that there are obvious differences in PS between rural and urban areas. Compared with cities, rural areas lag behind developed economic areas in terms of infrastructure, medical and health conditions, and education levels. On the contrary, urban residents are more likely to accept better service facilities and equipment and can better enjoy the convenience brought by the supply of PG, which makes the urban-rural gap more significant and serious.

This paper uses the gap in the number of medical beds between UR areas to measure the difference in the supply of public education goods in UR areas.

The average value of the gap between UR medical beds in all provinces across the country has gradually decreased with the increase of the year. That is to say, the difference in the supply of public education in UR areas is getting smaller and smaller across the country. The difference in PG supply is also gradually narrowing.

On the whole, the difference in public education between UR areas in the South is relatively large, and the difference in public education between UR areas is generally small. Cities in the southern region are relatively concentrated, and the distribution of high-quality medical resources is relatively concentrated. There is a significant difference in the supply of public medical products between UR areas.

2.3. Supply Mechanism. Since the founding of the People’s Republic of my country, government departments have taken a leading position in the supply of PS in our country. Although the socialist market economic system has been established at present, the market or social capital has not formed a corresponding influence in the supply of urban PG. The supply of goods is basically still funded by fiscal appropriations. With the continuous development of the socialist market economy with Chinese characteristics, the continuous enrichment of people’s material and cultural life, and the continuous improvement of the quality of public demand, but the government’s fiscal revenue is limited after all, the government adopts a “one size fits all” supply method for PS. It is difficult to meet the multilevel and high-quality requirements of urban residents for PG in terms of quality and quantity. At the same time, it is affected by related policies and the definition of property rights, as well as the long-standing ideology of excessive reliance on the government and the upward and downward management model. It restricts the awareness of participation of other subjects, resulting in a lack of cooperation mechanisms.
between subjects, and the lack of an incentive mechanism for the supply subjects to participate in the supply of PG has caused the PG supply mechanism to lose its power and source.

With the deepening of our country’s modernization process, the government has gradually made it clear that a single procurement entity cannot meet the material and cultural needs of the growing population: the supply of urban PG requires multilevel and multilevel supply. The current procurement situation is complicated: one is the scope of the quotation of the procurement organization is not clear. The division of labor and the role of the procurement organization are not clear. The transfer of functions, asymmetric information, and an effective financing mechanism have not been established. The state should have provided it free of charge, but the commodity PG is regarded as paid PG provided by the market. The second is that the scope of services between the market and the country is unclear. The government has a large number of procurement resources, the private sector does not properly control the resources to provide efficient procurement, and private companies cannot make full use of their advanced technological advantages. The third is the asymmetry of information on both sides of the supply. It is prone to mismatch between supply and demand, leading to some public utilities unable to meet the needs of residents, excessive waste of resources, and lack of effective channels. Fourth, there are loopholes in the government’s supervision mechanism and the lack of supervision on the right of public-private cooperation. It is easy to lead to inefficient delivery of urban public products, and the legal system still needs to be improved.

The government is necessary as the main body of supply of public products, but not all public products must be provided by the government. Social organizations, the third sector, farmer organizations, and individuals can all supply public products. Therefore, what the government has to do in the era of big data is to guide and encourage. This means that there needs to be a platform for all participants to share resources. The main influencing factors of the urban-rural public goods supply gap are the government’s macro intervention and control of the market, and whether enterprises, residents, and other subjects participate in it. The gap between UR PG supply in the era of big data is determined by many factors such as the level of economic development in rural areas, infrastructure conditions, and the quality of farmers themselves.

There are three main ways to provide PG: government procurement, market procurement, and voluntary procurement. The existing rural public product system in our country is no longer suitable for economic and social development and must be updated. The state should not become the only major provider of PG; it is necessary to diversify the supply methods of major social institutions and diversify the sources of financing for PG in order to reduce the pressure on the state from the provision of PG.

At present, the total supply of rural public products is insufficient, and the quality is insufficient. My country’s rural public products cannot adapt to the development of agricultural modernization. Therefore, it is necessary to change the political tendency of “emphasizing UR areas” in the supply of PG.

The balance of PS itself is an important means to alleviate the inter-regional conflicts caused by unbalanced development and achieve harmonious and balanced development between regions. Most importantly, balance embodies the concept of fair and equitable development compatible with socialism. The essential requirements of a harmonious society are the same as the development goals. “The integration of public utilities means that residents in different regions can use roughly the same public utilities under free market conditions.” It can be said that the concept of equilibrium has different expressions, but in any case, it must be judged from two points: one is the average concept. In this concept, it shows that people are born the same, have the same value, and deserve the same happiness and fair treatment. Second, the advantages are the same. Here, equality refers to maximizing social benefits while maximizing social influence. The concept of PG supply equilibrium can be summarized as follows.

According to the preferences and needs of UR residents, the government uses state public funds to provide public products under the conditions of a socialist market economy, so that UR residents can obtain public products on an equal basis. Regarding compensation, it actually requires that every resident be treated equally. However, according to the needs and preferences of residents, it is impossible to achieve complete equality, because preferences will be different, so we can only try to meet the needs of most people.

2.4. Urban-Rural Income Gap. The per capita net income of rural residents can be divided into wage income, net income from household operations, property income, and transfer income according to the source. There is no specific data on the per capita disposable income of urban residents. Only the statistical data on the per capita total household income of urban residents, as well as the subitem income such as wage income, net household income, property income, and transfer payment income, are basically the same as the four sources of per capita net income of rural residents, which can be compared. The Gini coefficient of urban-rural differences is decomposed by the source of income. This can be used as an important benchmark for the government to narrow the income gap by adjusting the income structure of residents.

The impact of the supply of rural PG on the urban-rural income gap is shown in Figure 1.

There is a huge gap in per capita disposable income between UR areas. In terms of income growth, both UR areas have shown a trend of steady growth. In terms of income growth, they have maintained relatively rapid growth in the past 15 years. From the perspective of per capita consumption expenditure growth, both UR areas have shown a steady growth trend. From the perspective of the growth rate of per capita final consumption expenditure, both UR areas maintain a constantly changing trend.
Although the urban-rural income gap has narrowed in recent years, the overall urban-rural disposable income ratio is still 2.72. The current urban-rural income gap and rural areas are still not optimistic. The main reason may be my country’s city-centric policy still exists on a large scale, which means that a large amount of resources and political contributions are usually in cities. Compared with cities, rural economic development is still relatively lagging, and farmers’ income levels are still relatively low.

The gap between factors and taxes created the initial urban-rural gap. In my country, there are serious inequalities in UR public expenditures and fiscal distribution. The proportion of agricultural expenditure in total national public expenditure is not only much lower than the proportion of agricultural production in GDP but also lower than the proportion of rural tax revenue in total national tax revenue. The formation of the dual urban-rural public investment system has led to the emergence and expansion of the education and medical gap between UR areas, which in turn led to the creation and expansion of the urban-rural income gap. Urban-rural capital flows and financial development have had a profound impact on the urban-rural income gap. Lack of money is one of the main reasons restricting the development of agriculture and rural areas. The income share of each sector and each factor is determined by their respective comparative productivity levels; that is, the higher the comparative productivity level of a factor or sector, the more value-added and income share it obtains. The division of labor between UR areas is due to the different division of labor between UR industries, and this different division of labor is subject to different transaction efficiencies.

### 2.5. Data Mining

With the rise of big data, data science came into being. Data science covers the entire process of collecting, cleaning, analyzing, visualizing, and applying data, ultimately helping people make and organize correct decisions. DM is the process of “extracting” hidden knowledge from incomplete and opaque data. This is the core of discovering knowledge in the database. In order to obtain valuable knowledge and insights from massive amounts of data, DM often has to resort to technologies in other fields, which represent a complex and multiplicity field. Preprocessing integrates relevant data from multiple data sources. DM extracts valuable knowledge information and data samples based on data and user needs. According to different evaluation criteria, valuable knowledge from the results of DM is selected. Knowledge representation, through interaction with the user, reveals the discovered patterns and information to the user. It is the role of association rules to find the relationship between the data in the massive data. In this paper, association rule algorithm is used to test the relationship between PG and residents’ income gap.

DM is a technology in the Internet era, which uses existing knowledge of computers and digital processing. It extracts potentially useful and valuable information from a large amount of information and hides content that humans cannot predict and cannot see. As a huge system, a large database can collect and analyze massive amounts of data. The core technology of DM is data processing, which transforms it into useful knowledge by filtering, extracting, and analyzing a large amount of effective information. In large databases, we can obtain a lot of relevant and practical value, meaningful value, and relevant information.

Association rules can be described as the implication of the form \( M \implies N \). Its definition is as follows:

\[
S(M \implies N) = P(M \cup N) = S_C(F).
\]

Among them, \( S_C(M \cup N) \) is the number of transactions where \( M \) and \( N \) occur at the same time. \( S_C(F) \) is the total number of transactions in database \( F \).

Confidence of association rules \( M \implies N \) is defined as

\[
Con(M \implies N) = \frac{P(M|N)}{S_C(M)}.
\]

Among them, \( S_C(M) \) is the total number of transactions containing itemset \( M \).

### 3. Urban-Rural Income Gap and PG Supply Model Estimation

#### 3.1. Variable Selection

The income ratio of UR residents is one of the most commonly used indicators to measure the urban-rural income gap. It directly compares the per capita disposable income of urban residents with the per capita net income of rural residents and uses the multiple relationships of UR residents’ income to describe the income gap. It has the advantages of simple calculation and intuitive results and is widely used by economic workers.

The scope of public rural products includes infrastructure, basic education, financial services, medicine and health, social assistance, employment placement, pension insurance, and affordable housing. What they have in common is that they need sufficient financial support. Funds are the most comprehensive indicator reflecting the supply of rural PG.

#### 3.2. Stationarity Test

In order to avoid false regressions and invalid conclusions, it is necessary to test the stationarity of the time series and determine the choice of the test equation.
according to the appropriate data characteristics. The income ratio of UR residents, the dual economic structure coefficient, the proportion of agricultural public expenditure, and the proportion of agricultural loans are observed. Therefore, the time trend model is used when running the unit root test.

3.3. Cointegration Test. This paper uses the Johansson test to analyze the long-term equilibrium relationship between the urban-rural income gap and the supply of rural PG.

Before testing, we must first determine the structure of the VAR model and use the criteria AIC, SIC, and LR as the testing criteria for the optimal number of lag periods in the VAR model. When the minimum value of the AIC and SIC criterion statistics and the maximum value of the LR statistics are obtained, the delay period is the optimal number of delay periods.

4. Result Analysis

4.1. The Income Gap between Urban and Rural Areas and the Supply of PG in the Province in the First Five Years. This article chooses the proportion of fiscal expenditure on agriculture and the proportion of agricultural loans to represent the supply of rural PG. The time span of the econometric model in this article is 2016–2020. Among them, the income ratio of UR residents is expressed by DIS, the dual economic structure coefficient is expressed by DUAL, the proportion of fiscal expenditure on agriculture is expressed by FISC, and the proportion of loans is expressed by LOAN. Details are shown in Table 1.

As shown in Figure 2, we can see that the income ratio of UR residents is above 2, indicating that the distance between UR areas is still a bit large. The overall dual economic structure coefficient is around 7, and the proportion of fiscal expenditure on agriculture is roughly around 0.05, indicating that there are still problems with agricultural supply.

4.2. Analysis of Stationarity Test Results. The ADF test using Eviews5.0 found that the ratio of UR residents’ income, the doubling of the economic structure coefficient, the share of family agricultural expenditures, and the share of agricultural loans are all transient sequences, and their differential elements are the first order of all fixed lines. The details are shown in Table 2.

4.3. Analysis of Cointegration Test Results. The Johansson test is used to determine whether there is a cointegration relationship between the urban-rural income gap and the supply of rural PG. This paper uses a form of cointegration test, and the results are shown in Table 3.
Table 2: Analysis of the stationarity test results.

| Indicators | ADF inspection value | 1% critical value | 5% critical value | Smoothness |
|------------|----------------------|-------------------|-------------------|------------|
| DIS        | -3.225               | -4.215            | -3.546            | No         |
| DUAL       | -2.956               | -4.195            | -3.521            | Yes        |
| FISC       | -3.562               | -4.167            | -3.514            | No         |
| LOAN       | -3.129               | -4.167            | -3.514            | Yes        |

Figure 3: Analysis of the stationarity test results.

Table 3: Analysis of the cointegration test results.

| Characteristic value | Trace statistics | 5% critical value | P value |
|----------------------|------------------|-------------------|---------|
| 0                    | 0.6891           | 51.256            | 45.857  | 0.012    |
| 1                    | 0.3152           | 14.652            | 28.651  | 0.785    |
| 2                    | 0.0245           | 0.7169            | 3.8453  | 0.394    |

Figure 4: Analysis of the Cointegration test results.
As shown in Figure 4, we can see that at the 5% level of significance, there is cointegration among the four variables: the ratio of UR residents’ income, the coefficient of dual economic structure, the proportion of fiscal expenditure on agriculture, and the proportion of agricultural loans.

5. Conclusion

Our country is currently in the “new normal” stage. As one of the most important components of the total social demand, PG has received extensive attention and attention. On the one hand, due to the rapid development of information network technology in the era of big data, emerging concepts such as Internet+ are widely used in people’s lives. On the other hand, it is also because the state adopts financial subsidies for UR PS. As my country still has a certain gap between UR areas, the supply of PG in UR areas will also be different. The research in this paper can promote the joint efforts of our national government and enterprises to improve the difference between UR areas, so as to achieve the effect of balanced development.

Data Availability

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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