

How to Promote High-Quality Economic Development by Reforming GDP Accounting Methods

Hongfei Zhang

*Junan County Bureau of Statistics, Linyi, Shandong, 276600, China
1175651700@qq.com*

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Abstract: The establishment of the GDP accounting system is to better count the weights of various indicators. However, with the reform or improvement of the GDP accounting methods that affect the economic formation in the process of social and economic development, the National Bureau of Statistics has carried out a series of reforms on the GDP accounting methods in recent years. Although there is still a certain gap with the international standard of GDP accounting, it can basically reflect the proportion and weight relationship of China's high-quality economic development. This paper is based on several key variable indicators of the latest GDP accounting method: 1. disposable income of urban residents, 2. disposable income of rural residents, 3. total export, 4. fiscal expenditure, 5. tax revenue, 6. investment in fixed assets, 7. total retail sales of social consumer goods, 8. urban unemployment rate, 9. added value of industries above national scale, 10. total population, 11. expenditure for research and experimental development of the whole society. This paper also carries out AHP multi-level analysis. Based on the accuracy of data sources, the data in China Statistical Yearbook 2021 issued by the National Bureau of Statistics in 2021 shall prevail. Thus, it is concluded that the total export, the total retail sales of social consumer goods, and the expenditure of research and experimental development of the whole society are the top three in terms of weight. It can be seen that high-quality economic development is inseparable from foreign trade, domestic demand and investment in science and technology.

1. Introduction

Compared with developed countries, there are still some gaps in China's GDP accounting methods, which are mainly reflected in the accuracy of accounting methods and international standards. The accuracy of accounting is mainly reflected in its inability to adapt to the changes in economic form brought about by the growing progress of information technology. In particular, the industrial ecology dominated by the Internet economy has affected the accuracy of GDP accounting methods. Under such a background, the innovation and reform of accounting methods can no longer be avoided. This phenomenon of changing the economic ecology due to the development of economic form is a common phased change in developing countries. The GDP accounting methods must keep up with the pace of the times in order to better reflect its historical mission of helping the

high-quality economic development ^[1].

2. Overview of China's GDP Accounting Methods in the New Era

With the continuous emergence of new economic forms, doing a good job in economic analysis and management has become a key part of government work. With regard to the continuous emergence of new demand, China's GDP accounting methods need to be further reformed to help the high-quality economic development.

China has gradually established the GDP accounting system and methods since 1985, when it introduced the core indicator gross domestic product (GDP) of *System of National Accounts* (SNA) developed by the United Nations. In 1987, the above-mentioned scheme was revised on the basis of soliciting opinions from relevant parties. The *Interpretation of Major Indicators of National Income and GNP Statistics* ^[2] was formulated, and the *GNP Statistical Reporting System* was formulated. It is worth noting that since 1993, national income has replaced the core indicator of the *Material Product Balance Sheet System* (MPS) as the core indicator of GDP accounting. However, GDP accounting reflects the economic operation from the aspects of economic growth, economic scale, economic structure and so on. It can sort out the problems in the process of economic development from the macroeconomic level, evaluate the achievement of phased development goals, and make better and faster decisions. Since the establishment of the GDP accounting system, the National Bureau of Statistics has carried out a series of reforms on the GDP accounting methods, continuously improving the scientificity and international comparability of the GDP accounting methods. However, compared with the international standards of national accounts and developed countries, there are still some gaps in China's GDP accounting methods. At the same time, with the continuous progress of science and technology, the continuous improvement of innovation ability, the continuous production of new situations in economic development, and the continuous production of new demands for economic analysis and management, China's GDP accounting methods need to be further reformed and developed.

3. Analysis on the Importance of GDP Accounting Method Reform

In the new era, China's economic development has shown a trend of diversity and diversification, but the GDP accounting methods still use the past economic measurement indicators, which is obviously unable to meet the needs of the rapid development of the new economic form. The world economic pattern is also changing. On the one hand, new economies are constantly emerging. For example, China has become the second largest economy in the world. On the other hand, in order to pursue the needs of high-quality economic development, we need to focus on the depth and sustainability of economic ecology. For example, the cost and expenditure of scientific and technological research are rising day by day. Compared with its input, it is obvious that scientific research results bring high-quality economic development. This is because science and technology is not only a productive force, but also a necessity to guide high-quality economic development. Starting from adapting to the changes in the world economic development environment, in recent years, the United Nations and other international organizations have made several major revisions to the international standard SNA for national accounts. Based on China's national conditions and actual conditions, the improvement of GDP accounting methods also needs to follow objective laws. In recent years, the National Bureau of Statistics has carried out a series of reforms on GDP accounting methods, which also confirms its importance.

With the continuous progress of information technology, China's informatization level plays an important role in the national economy. Among them, the software and hardware that are related to information technology have a large amount of expenditure in the process of improving the

informatization level in China, and the demand for software and hardware that are related to information technology will remain high in the future economic development. According to the old GDP accounting methods in the past, no matter what kind of software and hardware purchase expenditure, the general hardware will be included in the fixed capital. However, due to the lack of necessary policies, regulations and information, the relevant software expenditure purchased separately is often not treated as fixed capital. However, China's software expenditure, including information service fees based on Internet platform, online apps, network technology services and so on, has played a positive role in the whole process of high-quality economic development. Although the expenditure on computer software purchased in the market has been adjusted from intermediate input to fixed capital formation and included in GDP (National Economic Accounting Department of the National Bureau of Statistics, 2007), there are still some deficiencies in this reform. A large number of virtual forms of software have not been included in fixed capital formation, and it is still necessary to name information technology software and hardware separately. This will help to better grasp the large amount of consumption generated by more than one billion Internet users in GDP accounting, including the decoration and design of online stores and the information-based products realized online by Internet users. At present, this area is still relatively hidden and needs to be realized through accurate data collection with the help of big data, which is of great significance for measuring high-quality economic development.^[3]

The other is the reform of the accounting methods for scientific research and development expenditure. The current stage is the second stage conducive to the productivity improvement of science and technology. In the past, science and technology was the primary productivity. Now science and technology are the engine of high-quality economic development. It is no exaggeration to say that innovation and technological progress play an important role in improving labor productivity, capital and resource use efficiency. Therefore, it has become an important means to deal with the problems of resources, environment and population, and an important driving force to promote high-quality economic development. Research and development is an effective measure to promote the progress of innovative technology. According to the recommendations of SNA in 2008, the National Bureau of Statistics has reformed the accounting method of R & D expenditure, and the R & D expenditure that can bring economic benefits to owners is no longer regarded as intermediate input, but as fixed capital formation and included in GDP.^[4]

This reform has an important guiding and incentive role, which is conducive to guiding local governments, enterprises, scientific research institutions and universities to increase R & D investment, so as to promote the progress of innovative technology, and make it play an increasingly important driving role in economic development, quality and efficiency improvement, transformation and upgrading.

4. Empirical Analysis of GDP Accounting Methods

4.1 Process Raw Data

The data of economic growth in 31 regions in 2020 and 2021 and the data of 11 related indicators in the above table are collected here. These data are from the *China Statistical Yearbook 2021* issued by the National Bureau of Statistics. The 11 variable indicators can meet the needs of empirical analysis of high-quality economic development in the GDP accounting methods. (as shown in Figure 1)

Variable indicators	economic growth (%)
1. disposable income of urban residents	8.1
2. disposable income of rural residents	7.1
3. total export	21.2
4. fiscal expenditure	8.4
5. tax revenue	10.7
6. investment in fixed assets	4.9
7. total retail sales of social consumer goods	12.5
8. urban unemployment rate	5.1
9. added value of industries above national scale	6.1
10. total population	0.34
11. expenditure for research and experimental development of the whole society	14.2

Fig.1: Indicators Related to China's Economic Growth

4.2 Selection of Relevant Economic Indicators and Its Basis

The economic indicators related to GDP selected in this paper cover several important areas of economic development. In selecting the 11 principles, on the one hand, the connection between variables and GDP indicators should be considered. On the other hand, the reliability and relative independence of indicator data sources should be considered. Moreover, the timeliness or representativeness of these indicators should be considered. From the perspective of variable indicators, it basically includes the traditional driving forces: investment, consumption, foreign trade, as well as several major aspects of economic fields such as Internet consumption, scientific research expenditure and people's living standards in the new era. At the same time, we calculate the total population and unemployment rate into the components of the GDP accounting methods. Through further analysis, we conclude that there is a correlation between them and high-quality economic development.

4.3 AHP Multi-Level Analysis

4.3.1 AHP Analysis Results

Table1. AHP data

disposable income of urban residents	disposable income of rural residents	total export	fiscal expenditure	tax revenue	investment in fixed assets	total retail sales of social consumer goods	added value of industries above national scale	total population	expenditure for research and experimental development of the whole society
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	disposable income of urban residents	disposable income of rural residents	total export	fiscal expenditure	tax revenue	investment in fixed assets	total retail sales of social consumer goods	added value of industries above national scale	total population	expenditure for research and experimental development of the whole society
disposable income of urban residents	1.000	1.111	0.455	0.909	0.769	2.000	0.667	1.429	25.000	0.625
disposable income of rural residents	0.900	1.000	0.435	0.833	0.714	1.667	0.625	1.250	20.000	0.588
total export	2.200	2.300	1.000	2.500	2.000	5.000	1.429	3.333	100.000	1.250
fiscal expenditure	1.100	1.200	0.400	1.000	0.833	2.500	0.769	1.250	1.000	1.000
tax revenue	1.300	1.400	0.500	1.200	1.000	3.333	0.909	1.667	25.000	0.769
investment in fixed assets	0.500	0.600	0.200	0.400	0.300	1.000	0.588	0.833	2.500	0.526
total retail sales of social consumer goods	1.500	1.600	0.700	1.300	1.100	1.700	1.000	1.667	33.333	0.833
added value of industries above national scale	0.700	0.800	0.300	0.800	0.600	1.200	0.600	1.000	16.667	0.625
total population	0.040	0.050	0.010	1.000	0.040	0.400	0.030	0.060	1.000	0.476
expenditure for research and experimental development of the whole society	1.600	1.700	0.800	1.000	1.300	1.900	1.200	1.600	2.100	1.000

The original data of AHP is converted (i.e., input data of manual calculation) as shown in Table 1 above. It needs to meet three conditions:

First, the diagonal of the upper right and lower right of the AHP data format must be 1, so it can mean that it is completely equal to itself, and the indicators compared with it reflect the importance of its comparison;

Second, the data in the upper right corner and the lower left corner are in reciprocal symmetric format for cross and multiple comparison;

Third, figures represent the relative importance of indicators. The larger the number, the stronger the relative importance. Otherwise, it is smaller.

Table 2. Random consistency RI table

n order	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RI value	0.52	0.89	1.12	1.26	1.36	1.41	1.46	1.49	1.52	1.54	1.56	1.58	1.59	1.5943
n order	17	18	19	20	21	22	23	24	25	26	27	28	29	30
RI value	1.6064	1.6133	1.6207	1.6292	1.6358	1.6403	1.6462	1.6497	1.6556	1.6587	1.6631	1.6670	1.6693	1.6724

Note: when using AHP to calculate the weight, consistency test analysis is required;

First, two index values, CI and RI, need to be used for consistency inspection;

Second, the CI value has been calculated, and the RI value can be obtained by querying the table above.

In this study, a 10-order judgment matrix is constructed. Corresponding to the above table, the random consistency RI value is 1.490, which is used for the following consistency test calculation.

It can be seen from the above table that for a total of 10 items, i.e. disposable income of urban residents, disposable income of rural residents, total export, fiscal expenditure, tax revenue, investment in fixed assets, total retail sales of social consumer goods, added value of industries above national scale, total population, expenditure for research and experimental development of the whole society, a 10-order judgment matrix is constructed to conduct AHP multi-level research (the calculation method is sum product method). The eigenvectors obtained from the analysis are (0.928,0.831,2.331,0.917,1.174,0.472,1.250,0.698,0.200,1.199), and the corresponding weight values of 10 items are 9.282%, 8.312%, 23.311%, 9.168%, 11.743%, 4.722%, 12.499%, 6.980%, 1.998% and 11.985% respectively. In addition, the maximum characteristic root (12.739) can be calculated by combining the characteristic vector, and then the CI value (0.304) $[CI = (\text{maximum characteristic root} - n) / (n - 1)]$ can be calculated by using the maximum characteristic root value. The CI value is used for the following consistency inspection.

Table 3. Summary of consistency inspection results

the maximum characteristic root	CI value	RI value	CR value	Consistency inspection results
12.739	0.204	1.490	0.094	Pass

When using AHP multi-level method to calculate the weight, it is necessary to conduct consistency test analysis to study and evaluate the consistency test results of the weight calculation results, that is, to calculate the consistency index CR value $(CR = CI/RI)$.

First, describe the CI value calculated above $[CI = (\text{maximum characteristic root} - n) / (n - 1)]$;

Second, the RI value is obtained by combining the order of the judgment matrix;

Third, calculate CR value and make consistency judgment.

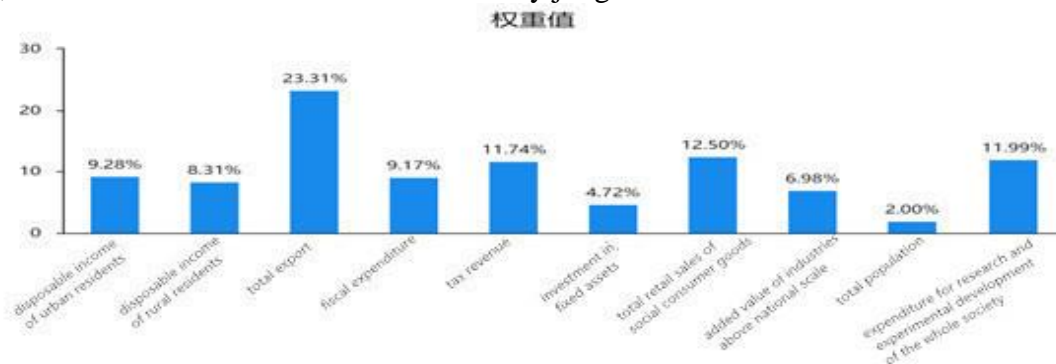


Fig.2: Weight Value Diagram

4.3.2 Discussion

In the AHP multi-level analysis, it can be seen that the highest weight values are the total export, total retail sales of social consumer goods, expenditure for research and experimental development of the whole society. It can be seen that the main force of China's high-quality economic development in the emerging stage comes from these three areas. Compared with the traditional three major demands, there are some changes, and it is not difficult to see that the reform of GDP accounting method is very necessary. This can more accurately respond to changes brought about by economic development. However, the total population and the investment in fixed assets rank last, from which we can see that the population factor has little impact on the high-quality economic development, indicating that China has moved from a large productivity country to a scientific, service-oriented and innovative economic format. At the same time, due to the impact of objective factors, the investment in fixed assets accounts for a relatively low proportion, mainly referring to real estate, which also shows that the influence of real estate investment is shrinking.

5. Thoughts on the Optimization and Reform of GDP Accounting Methods in the New Era

As mentioned above, compared with the international standards for national accounts and developed countries, there are still some gaps in China's GDP accounting methods. With the continuous progress of science and technology and the continuous improvement of innovation ability, new situations continue to emerge in economic development. In order to better adapt to the new situation arising from economic development, meet the new needs arising from economic analysis and management, better implement the international standards for national accounts, and narrow the gap with developed countries, the GDP accounting methods need to be further reformed to help the high-quality economic development and further improve the scientificity and international comparability of China's GDP accounting methods.

5.1 Software Expenditure Accounting Methods Need to Be Optimized and Reformed

Computer software is an important part of intellectual property products in the international standards of national economic accounting, and its expenditure should be treated as fixed capital formation. Since the first economic census, China's GDP accounting has treated the computer software purchased from the market as fixed capital formation. However, due to the lack of support from data sources, the expenditures of enterprises, universities and scientific research institutions for developing their own computer software have not been treated as fixed capital formation. In order to more comprehensively reflect the role of computer software in economic development, better implement international standards, and further improve the international comparability of China's GDP accounting methods and data, it is necessary to establish a statistical investigation system for the research on the expenditure of computer software developed and used by enterprises, universities and scientific research institutions, and further reform the accounting methods of computer software expenditure.

5.2 Reform of Virtual Data Expenditure Accounting Methods

With the rapid development of digital technology, the ability of human beings to collect, store, process, analyze and apply data has been greatly improved, which promotes the rapid accumulation of data and plays an increasingly important role in economic and social development. How to deal with data expenditure in GDP accounting is not only a very important basic work, but also an international problem that has not been solved. China's Internet, Internet of things, big data, cloud

computing and other digital technologies are developing rapidly. Data is playing an increasingly important role in enterprise production and operation, government governance and residents' lives. It is of more practical significance to strengthen the research on data expenditure accounting methods. The Fourth Plenary Session of the 19th Central Committee of the Communist Party of China incorporated data into production factors for the first time and emphasized the formation of its income distribution mechanism. It is necessary to explore the statistical scope, basic characteristics, basic classification, data sources and valuation methods of data assets, so as to provide a scientific basis for the reform of data expenditure accounting methods and the corresponding economic management and decision-making.

5.3 Use International Experience for Reference, Study and Formulate a Practical Accounting Method for R & D Expenditure

Self-improvement can be achieved by learning from foreign advanced experience. For example, the internationally accepted total cost method is used to calculate the output of R & D activities, mainly for some subjects with fuzzy boundaries, including intermediate input cost, labor cost and fixed asset cost, and the perpetual inventory method is used to calculate the R & D capital stock. The constant price accounting adopts the price index reduction method, and constructs the R & D investment price index by using the weighted average of the industrial producer purchase price index, the R & D personnel wage index and the fixed asset investment price index. The main basic data of R & D expenditure accounting are R & D expenditure and its classification data in the scientific and technological statistical survey. In general, the inclusion of R & D expenditure in GDP not only has an impact on China's national economic accounting system and methods, but also has an impact on China's national economic development. It is mainly reflected in the following aspects. First, the GDP accounting system is in line with international standards. The reform of R & D expenditure accounting methods fundamentally reflects China's great success on the road of scientific and technological development. At the same time, it helps to improve China's GDP accounting system and methods, narrow the gap between China's GDP accounting system and the new international standards and developed countries, and improve the international comparability of statistical data. Second, it can promote the continuous R & D investment of high-quality enterprises, create better conditions for them to enhance risk resistance and ecological transformation and upgrading, achieve an important means to improve the quality and efficiency of economic growth and realize transformation and upgrading. Third, it can achieve the goal of increasing the total GDP. After the R & D expenditure is included in GDP, China's GDP has indeed increased in each year. With the increasing proportion of R & D expenditure in GDP, its weight will increase accordingly.

6. Conclusion

Under the correct leadership of the Party Central Committee, the National Bureau of Statistics has made good achievements and experience in the reform of China's GDP accounting methods. In the new era, as long as we firmly grasp the pulse of the times, give full play to the rigorous and serious side of China's statistical front, aim to achieve the accuracy of GDP accounting, and comprehensively summarize the existing accounting methods, we can promote the further optimization and reform of GDP accounting methods, and better contribute to high-quality economic development.

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