Title: The Efficiency of Resource Allocation in Higher Education in India Based on DEA-Tobit Model

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Abstract

Higher education in India has grown rapidly since independence, becoming the world's largest higher education country after the United States. In the research, the basic theory of higher education resource allocation efficiency was described. Then the regional distribution of higher education resources, the current situation of inputs and outputs in the central region were described. Then DEA analysis was used to evaluate the efficiency of higher education resources in the central region and projection analysis, and Tobit model was used to test the factors influencing the efficiency of higher education allocation in the central region. The efficiency evaluation and projection analysis of higher education resources in central region were conducted by using DEA analysis, and the Tobit model was used to test the factors influencing the efficiency of higher education allocation in central region. The empirical results show that the resource allocation efficiency of higher education in central region is not determined by education funding alone, but depends on the optimization of resource input combination.

Keywords: DEA-Tobit; Indian higher education; resource allocation
AMS 2020 codes: 97B40

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1 Introduction

India is a close neighbor of our country and it is a large country in South Asia. Although education was well developed in ancient times, it became declined in the 16th and 17th centuries due to the disconnection from real life. After independence, due to the high importance attached to higher education by successive national leaders, Indian higher education embarked on a rapid development path[1]. According to the Department of Education, Ministry of Human Resource Development, the number of universities in India grown to 436 and colleges to 27,852 in 2016. Enrollment also increased geometrically from 170,000 in 1950-1951 to 20,740,740 in 2016-2017. Among these colleges and universities, India is home to a number of universities that are recognized worldwide for their excellence, such as the University of Delhi, the University of Bombay, the University of Calcutta, and the National Key College System of India, etc[2]. The rapid development of higher education has provided a large number of talents for the development of Indian economy and society, and three of them have won the Nobel Prize. The development of its economy is also obvious, especially the rise of the IT (Information Technology) industry represented by the software industry, which has attracted the attention of the world. All these achievements of India cannot be achieved without the contribution of Indian higher education to its talent training after independence[3]. Especially after the 1980s, India has paid more attention to the issue of quality assurance of higher education and gradually established a quality assurance system of higher education that follows international practices and highlights its own characteristics. In the research, the higher education quality assurance system was introduced and analyzed in detail. On this basis, the characteristics of Indian higher education quality assurance system, as well as the problems encountered and the measures taken by India in improving this system were summarized[4].

2 Literature Review

In order to cope with the growing demand for education and ensure the quality of higher education, after years of practical exploration, China has initially formed a higher education quality assurance system of "government protection as the main body, school protection as the main body, supplemented by civil assessment". However, due to the late start of quality assurance work in higher education in China, many problems have emerged in practice[5]. Especially in China's higher education quality assurance, the theoretical research is relatively lagging behind, the relevant policies and laws are not perfect, the government's power is too large, and the function of social and civil protection is not well played. Therefore, in order to improve the quality assurance system of higher education in China and promote the healthy and orderly development of higher education in China, it is necessary to absorb and learn from the quality assurance experiences of different countries in the world and gain enlightenment from their failure lessons[6].

It is also true that our scholars have attracted many successful experiences from the quality assurance system of higher education in foreign developed countries to build a higher education quality assurance system with Indian characteristics. However, after all, the national conditions faced by each country are different, and the development path of higher education in each country is also different. The different development paths will certainly affect the effectiveness of our experience from developed countries. Compared with developed countries, India has more similarities with our country[7]. These similarities include the fact that we are among the four ancient civilizations of the world, we have experienced the invasion of developed countries in the West, and we are both developing countries with large populations. In order to solve these problems, India improves the quality of higher education in India and improves the quality assurance system of higher education in India[8]. India actively participates in international or regional associations for quality assurance of higher education, and actively builds its own quality assurance system to improve the quality of
higher education in India and enhance the competitiveness of India in the international arena to a certain extent. Therefore, the study of Indian higher education quality assurance system will not only broaden the horizon of comparative higher education research in China, but also enrich and improve the theoretical knowledge of higher education quality assurance in China[9].

3 Theoretical Basis of Resource Allocation Efficiency in Higher Education

3.1 Higher education resources

3.1.1 The meaning of higher education resources

Corresponding investments in higher education are essential to allow higher education activities to proceed properly. Higher education resources generally refer to the resources that constitute, maintain, and serve the higher education system. There are "soft" and "hard" resources in higher education. Hard resources are the resources that we can see in a fixed form, which can be used directly in the educational process. The human resources of higher education are mainly the teaching and research staff, administrative staff, managers and logisticians who work in universities[10]. Physical resources of higher education are the educational facilities provided by the government, enterprises and other social organizations in the process of higher education activities, such as libraries, science laboratories, teaching buildings, etc. Financial resources refer to the educational investments made by the main beneficiaries of higher education, such as the government, enterprises and individuals, and the national and regional financial expenditures on education are the main financial resources for higher education activities. The "soft" resources are also called intangible resources, which refer to the value of the above-mentioned educational resources in the process of using and exploring the human resources in higher education activities[11].

3.1.2 Characteristics of higher education resources

Higher education resources are special in themselves because they have the characteristics of both resources and education. Broadly speaking, the specific characteristics of higher education resources are as follows.

1) Non-substitutability

The irreplaceability of higher education resources is determined by their specific status. The usefulness of higher education is obvious, whether in socio-economic, social development, cultural heritage, technological innovation, etc. Internationally, the quantity and quality of higher education resources are also the main factors leading to the gap between national strengths[12]. Moreover, the position occupied by higher education resources in the competition of comprehensive national power is becoming more and more obvious due to its own scarcity, and the excavation of human resources is an important driving force of economic development in the world today. On the other hand, due to the nature of higher education, it is also the reason why higher human resources reflect irreplaceability. Higher education cultivates comprehensive talents with strong practical and creative abilities, and higher education is special and irreplaceable[13].

2) Liquidity

The circulation of higher education resources is divided into temporal circulation and spatial circulation. As time changes, higher education resources change with it, and this is the
temporal circulation. It is possible for today's higher education resources to become unranked tomorrow, while today's so-called unranked resources may become first-rate resources tomorrow. From a spatial perspective, the ability of higher education resources to move continuously between regions also makes it possible for higher education resources to be shared. Nowadays, changes in higher education encourage cross-school, cross-professional, and cross-regional cooperation, thus constituting an exchange platform for cross-regional and cross-professional research by realizing the common access to resources. The sharing of higher education resources is especially manifested in the mobility of human resources, which generally takes the form of the mobility of talents in different regions[14].

3) Tangibility and intangibility

From the viewpoint of resource expression, higher education resources can be divided into tangible and intangible, which are the "hard power" and "soft power" of colleges and universities as we usually call them. Teachers, fixed assets, teaching equipment and facilities are the manifestation of higher education tangible resources. The intangible resources of the university are mainly composed of teaching brand, teaching strength, cultural heritage and management rules and regulations of the university.

4) Delay in economic benefits

The ultimate goal of education is to guide people to explore their own potential. The potential of human being is not only to improve the education and knowledge, but also to show the invisible aspects such as comprehensive quality and connotation. Since the cultivation and performance of comprehensive quality takes a long period of time, the economic benefits of higher education take a longer time to manifest and at the same time its performance is not obvious. For example, a person who has received only secondary education can join the workforce earlier and provide services to society for a longer period of time[15].

5) Motivation

The improvement of the level of higher education has a positive impact on improving the overall national scientific awareness and comprehensive quality. This not only promotes the development of social economy, but more importantly, has positive significance for social literature and cultural heritage innovation. From the perspective of individuals, higher education not only greatly improves the overall knowledge level of the whole society, but also improves the cultural level and comprehensive quality of the nation. It also improves people's self-learning ability and the overall working ability of the people, which also lays the foundation for people to obtain better living conditions. It is clear from the above theory that higher education resources as a resource with special characteristics. Its progress activities are distinctly different from other production activities, and also have irreplaceable nature.

3.2 Factors influencing the efficiency of higher education resource allocation

1) Economic factors

Economic factors are important factors affecting the efficiency of higher education resource allocation. The allocation of higher education resources is inseparable from the development level of social economy. Since science, education, culture and health require huge capital investment, the government cannot use all the revenue to develop education, and when the total economic amount is insufficient, the government will put less money into education, and
when the economic level is higher, the government can increase education expenditure accordingly. Due to the regulations of higher education management system, the central and local governments are required to pay the financial education expenses in proportion to each other, and most of the costs of higher education in the region are borne by local governments. According to the different economic conditions between regions, there is a large gap between the regions in terms of the amount of education expenses and the distribution of education resources for each person[16].

2) Policy factors

Under the influence of the management system of higher education, the allocation of resources in higher education in China is in many ways implemented through administration, and higher education policies play a relatively important role in guiding the allocation of higher education resources. In the primary stage of reform and opening up, the state adopted the policy of highly concentrated efforts to build key universities and open key disciplines in order to rapidly build key universities and develop related disciplines, and invested a large amount of education expenses to certain key schools in the eastern region, and there was a big difference in the education expenses between key schools and general schools in different regions in the east, middle and west. After reaching the stage of mass education of higher talents, the state focused on the development of higher education in order to meet the need for high quality talents at high economic level[17]. By adjusting the management mechanism, investment mechanism and fund allocation mechanism of higher education, it has greatly enhanced the help to central and western cities and special schools, and also promulgated relevant policies that are favorable to central and western cities and special schools, taking care of these cities and schools in the allocation of higher talents cultivation resources, effectively promoting the higher education career in eastern, central and western cities, key schools and general schools.

3) Resource allocation method

Each of the three ways of resource allocation - plan, market, and the combination of plan and market - has its own characteristics, and different allocation methods have different impacts on the future development of universities. Under the plan-led allocation method, the allocation of higher education resources in terms of students' sources, teachers' quality and funding budgets is led by the state, which follows the state's plan and makes timely regulation when the allocation of higher education resources is ineffective and inefficient, but does not reflect the actual pursuit of higher education resources in the development of higher education institutions in a timely manner. The market allocation method is based on the market competitiveness of each university and the economic benefits it can produce to determine the number and quantity of resources allocated to higher education, which may lead to the over-concentration of resources in developed regions and key schools. The organic combination of plan and market can ensure the balanced development of higher education by playing the macro-control role of the state in the allocation of higher education resources, and it can also reflect the strengths of market competition, ensure the enthusiasm of universities and ensure the efficiency and value of resource allocation caused by higher education. Therefore, the choice of higher education resource allocation method is of great significance to improve the efficiency of resource allocation[18].

3.3 Tobit regression analysis used for the efficiency evaluation in the research

The data envelope can be used to measure the effectiveness of the decisions. Researchers can find the cause of performance disruption by analyzing data from total performance results, pure performance
results and results. performance as a standard. But this type cannot find the conditions that affect all the performance. Therefore, it is necessary to use multivariate analysis technology to know the factors affecting the performance. The two-stage estimation model is to calculate the data first by applying the DEA model, then calculate the explanatory variable based on the performance results obtained from the previous calculation come, and then get some strange as explanation changed according to research needs[19].

Because the results of DEA model are between 0 and 1, which have truncated characteristics and differ from the coherence of the explanatory variables in general regression, the results obtained are difficult to be consistent if the general least squares method is adopted to perform regression calculations. In order to solve this problem, Tobit regression model, also known as intercept regression model, needs to be introduced, which can solve the problem of the existence of the results of the explanatory variables between 0 and 1. This model can be seamlessly combined with the DEA model. The standard Tobit model is like the one shown in Equation (1) and Equation (2), in which \( y_i^* \) is the latent variable, \( y_i \) is the dependent variable, \( x_i \) is the independent variable, and \( \varepsilon \) is a vector of correlation coefficients.

\[
y_j^* = ax_j + \varepsilon
\]  
(1)

\[
y_j = \begin{cases} 
y_j^* > 0 & \text{if } y_j^* > 0 \\
0, y_j^* \leq 0 & \text{if } y_j^* \leq 0
\end{cases}
\]  
(2)

4 Analysis of Resource Allocation Efficiency of General Higher Education in Central Area Based on DEA Method

4.1 The selection of indicators and data sources

In DEA model research, the selection of indicator system is a special issue worthy of attention, because the efficiency obtained by applying different indicator systems is different, and the selection of the indicator system can largely influence the evaluation results. Therefore, the selection of indicators is an important part of the evaluation of higher education efficiency by DEA method, and it is also the basis for the success of the evaluation. As far as the existing researches are concerned, there is no consistent standard for higher education input-output indicators, and the selection of indicators may vary among researchers because of different evaluation purposes and preferences[20]. According to the viewpoints of previous literature and combined with the principles of construction, the input-output index system of Koran education is established from two different perspectives of input and output respectively. Input indicators include human, material and financial resources; output indicators include talent cultivation, scientific research and social services. In the research, the index system of educational resources allocation efficiency of universities is shown in Table 1.

<table>
<thead>
<tr>
<th>Input indicators</th>
<th>Output indicators</th>
</tr>
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<tbody>
<tr>
<td>X1: Full-time faculty members</td>
<td>Y1: The number of students in school</td>
</tr>
<tr>
<td>X2: Budgeted financial education expenditure</td>
<td>Y2: The number of R&amp;D research results and research services</td>
</tr>
<tr>
<td>X3: Total value of fixed assets</td>
<td>Y3: The number of papers issued</td>
</tr>
</tbody>
</table>

X1: Full-time faculty members are those who are responsible for teaching in colleges and universities. Full-time teachers can be divided into assistant professors, lecturers, associate professors and professors according to their titles. Considering the quality of full-time teachers, the research
calculates the number of full-time teachers by assigning a weight of 1 to full-time teachers with no title and 1.5 and 2 to teachers with low and medium and high titles, respectively. The sample data were obtained from the Statistical Yearbook of Indian Education, 2014-2020, in units of persons.

X2: Budgeted financial education expenditure. The government plays a leading role in the allocation of education resources, and state financial education expenditure is the main source of education funding. The sample data are obtained from the Statistical Yearbook of Education Expenditure in India 2014-2020 in units of billions of CNY.

X3: Total value of fixed assets, which is the basic input for higher education institutions to conduct normal teaching and research, directly related to the level of teaching, research and social service of higher education institutions, and to a certain extent can reflect the level of hardware facilities of a higher education institution. The sample data are obtained from the Statistical Yearbook of Indian Education 2014-2020, in units of billios of CNY.

Y1: The number of students in school. The knowledge and skills acquired and the attitudes and behaviors developed by students in the process of receiving education are the direct output of colleges and universities when they cultivate talents. The number of students trained by colleges and universities can be reflected by the number of students trained by colleges and universities with different levels of education, such as specialist, undergraduate and postgraduate. In order to reflect the quality of students in school, the research sets the weight of undergraduate and specialist students as 1, and the weights of master and doctoral students as 1.5 and 2 respectively, so as to calculate the equivalent number of students in school. The sample data are obtained from Education Statistics of India 2014-2020, in units of persons.

Y2: The number of R&D research results and research services, which directly reflects the research workload of universities, is an important indicator to measure the contribution of a university to the achievements of society in terms of research. The sample data are obtained from the Compilation of Science and Technology Statistical Yearbook of Universities from 2014 to 2020, in units of articles.

Y3: The number of papers issued, which is an important indicator of the research capability of universities. The sample data are obtained from the Compilation of Science and Technology Statistical Yearbook of Universities from 2014 to 2020, in units of articles[21].

4.2 Analysis of the empirical process and results

By using DEAP2.1 software, the efficiency analysis of the resource efficiency of higher education in the central region from 2014 to 2020 was conducted, and the empirical results are as follows.

1) Comprehensive efficiency refers to the ability to combine the maximum output of a sector or organization with a fixed payoff for size. The lowest comprehensive efficiency value of higher education resource allocation in the central region in 2014-2020 is 0.782, and the average value is 0.972. From Table 2, it can be concluded that 23 out of 42 decision units have a comprehensive efficiency value of 1, which means that 23 decision units are DEA effective, i.e. the ratio of input and output of the comprehensive efficiency value of 1 decision unit is appropriate, and the most effective use of university resources is obtained to maximize the benefit. 19 decision units have the comprehensive efficiency value less than 1, and the comprehensive efficiency value of 0.782 in 2019 A is the lowest efficiency of university resource allocation in central region from 2014 to 2020. According to the statistical treatment by year, it can be seen from Table 2 that all the comprehensive efficiency values in central region in 2014 are 1, and there are 5 provinces with comprehensive efficiency values of 1 in
six central provinces in 2015, and there is a decreasing trend of comprehensive allocation efficiency of higher education resources in central region.

2) Cleanliness is the quality of work when considering returns. It can be seen from Tables 2 that the pure efficiency property of 13 decisions is less than 1, and the pure efficiency property of the other 29 decisions is equal to 1. Among them, the net operating result of Area B and Area C is 1, which shows that the efficient use of resources of Area B and Area C is high and there is no waste of the high educational resources. From 2014 to 2020, the net employment of Area A will be below 1 in 2019 only. In general, there is no great waste in the use of college supplies in the middle ground[22].

3) Scale efficiency is the efficiency when considering returns to scale, a measure of whether an organization's production scale is at the most suitable scale. As shown in Table 2, among the 42 decision units, 12 are in decreasing scale payoff, 5 are in increasing scale payoff and 25 are in constant scale payoff. The decreasing scale payoff means that the increase of output ratio is smaller than the increase of input resources ratio, and the input resources of universities need to be adjusted, and the scale of the university should be controlled to improve the utilization rate of existing resources. The increasing scale payoff indicates that the scale efficiency can be achieved by appropriately increasing the resources input of the university. The scale efficiency is less than 1, but the pure technical efficiency is 1, which indicates that the efficiency of resource utilization of colleges and universities in Area C also reaches the best. in Area D, Area E and Area F, the scale efficiency and the pure technical efficiency are less than 1 in the period of 2014-2020, accounting for more than 75%, these three provinces need to adjust the allocation of higher education resources and reasonably control the input and output so as to achieve the effectiveness of DEA.

### Table 2. Overall evaluation statistics of higher education resource allocation efficiency in the central region, 2014-2020

<table>
<thead>
<tr>
<th></th>
<th>The DEA evaluation results</th>
<th>The proportion of</th>
<th>Tote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive and effective</td>
<td>23</td>
<td>54.76%</td>
<td>42</td>
</tr>
<tr>
<td>The technology is effective</td>
<td>29</td>
<td>69.05%</td>
<td>42</td>
</tr>
<tr>
<td>Effective scale</td>
<td>25</td>
<td>59.52%</td>
<td>42</td>
</tr>
<tr>
<td>Scale benefit remains unchanged</td>
<td>25</td>
<td>59.52%</td>
<td>42</td>
</tr>
<tr>
<td>Increased scale efficiency</td>
<td>5</td>
<td>11.91%</td>
<td>42</td>
</tr>
<tr>
<td>Dimensional efficiency</td>
<td>12</td>
<td>28.57%</td>
<td>42</td>
</tr>
</tbody>
</table>

The results of DUM1-DUM7 decisions are the evaluation results of the efficiency of higher education resource allocation in Area D from 2014 to 2020. Among them, 4 decision units DEA are valid, 3 decision units DEA are non-valid, and the years of DEA non-valid are 2016, 2017, and 2018. As shown in Figure 1, the level of allocative efficiency in Area D is 1 in 2014, 2015, 2019, and 2014, and the efficiency level decreases in the middle 3 years, showing a trend of decreasing and then increasing. The pure technical efficiency and scale efficiency of Area D are below 1 at the same time in 2016-2018, which indicates that both technical factors as well as scale factors cause DEA non-effective. The Area D is constant from 2015 scale payoff, decreasing scale payoff in 2016 and constant scale payoff in 2018, which indicates that the resource allocation of higher education in Shanxi is constantly adjusting, and the input of higher education is changing and the output is changing with the increasing scale of universities. In the case of decreasing technology and scale, the scale payoff 2017 scale payoff is 1, the scale of college production is at the standard of the most suitable scale[23].
Figure 1. Higher education resource allocation efficiency in Area D, 2014-2020

The results of DUM8-DUM14 decisions are the evaluation results of the efficiency of higher education resource allocation in Area A from 2014 to 2020 (Figure 2). Among them, 6 decision units are DEA effective, 1 decision unit is non-DEA effective, and the higher education resource allocation efficiency of Area A in 2019 is non-DEA effective. In 2019, both pure technical efficiency and scale efficiency of Area A are less than the value of 1, and non-DEA effective because of the combined influence of scale factor and efficiency factor. The pure technical efficiency and scale efficiency values of Area A in 2014-2020 are consistent, and there is not only the problem of improper scale in 2019, while its input-output conversion capacity also needs to be strengthened. During the 7-year period, 2019 has seen a small fluctuation due to the pure technical efficiency as well as scale efficiency are less than 1. The scale payoff of Area A in other years is in a constant steady state.

Figure 2. Efficiency of higher education resource allocation in Area A, 2014-2020
The results of DUM15-DUM21 decisions are the evaluation results of higher education resource allocation efficiency in Area F for 2014-2020 (Figure 3). Among them, 2 decision units are DEA effective, respectively in 2014 and 2020, and 5 decision units are non-DEA effective. The average value of comprehensive efficiency in Area F from 2014 to 2020 is 0.934, and the average value of comprehensive efficiency in the central region is 0.972, and the efficiency values are lower than 0.95 in 2015 and 2016, and lower than 0.9 in 2017 and 2018, which shows that Area F has the lowest resource allocation efficiency among the six central provinces. In 2015, 2016, 2018 and 2019, the pure technical efficiency and scale efficiency of Area F are below 1, which indicates that the inefficiency of resource allocation in Area F is due to both technology and scale. From 2015 to 2019, the payoffs of scale in Area F are decreasing, which indicates that Area F needs to control educational inputs to adjust the allocation of higher education resources.

Figure 3. Efficiency of higher education resource allocation in Area F, 2014-2020

The results of DUM29-DUM35 decisions are the evaluation results of higher education resource allocation efficiency in Area E from 2014-2020 (Figure 4). The average value of allocation efficiency in Area E is 0.931, which is lower than the average value of efficiency in six central provinces. Among them, 2 decision units are DEA effective and 5 decision units are non-DEA effective. From 2015 to 2016, the scale efficiency of resource allocation in Area E decreases, and from 2016 to 2020, the scale efficiency increases. The decreasing scale payoff of resource allocation in Area E in 2016, 2019 and 2020 indicates that the scale of education input should be effectively controlled to mitigate the problem of excessive scale affecting allocation efficiency.
In the research, the Tobit regression model was developed based on the selected indicators to study the factors influencing the efficiency of higher education resource allocation in the central region, as shown in Equations (3) and (4), where $y_i^*$ represents the pure technical efficiency value of education resource allocation in the i-th region measured by the data envelopment model in the first stage.

$$y_i^* = a_1F_1 + a_2F_2 + a_3F_3 + a_4F_4 + a_5F_5 + C$$  \hfill (3)

$$y_i = \begin{cases} y_i^*, & y_i^* < 1 \\ 1, & y_i^* \geq 1 \end{cases}$$  \hfill (4)

The rationale of Hausman's test is that the variables may be omitted in the actual research because not all variables are taken into account, and there may be correlations between some independent variables and the disturbance terms, which may lead to inaccurate estimates of the parameters. This may lead to inaccurate parameter estimates. In order to avoid this phenomenon, we need to test the model, but it is difficult to test whether the relevant variables are omitted, so we usually test the correlation between the variables and the interfering terms directly. In the research, we use Eviews 6.0 to perform Hausman test on the model, and the output value of its statistic is 81.534718.

Tobit analysis was performed using Eviews 6.0 and the results were obtained as in Table 3.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation coefficient</th>
<th>Standard deviation</th>
<th>Statistics</th>
<th>Companion probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1.020719</td>
<td>0.017453</td>
<td>58.48307</td>
<td>0.0000</td>
</tr>
<tr>
<td>F1</td>
<td>-0.14510</td>
<td>0.014222</td>
<td>-1.020253</td>
<td>0.0376</td>
</tr>
<tr>
<td>F2</td>
<td>0.823184</td>
<td>0.066889</td>
<td>12.31650</td>
<td>0.0086</td>
</tr>
<tr>
<td>F3</td>
<td>0.492328</td>
<td>0.019268</td>
<td>2.555453</td>
<td>0.0106</td>
</tr>
<tr>
<td>F4</td>
<td>0.142117</td>
<td>0.017002</td>
<td>0.842061</td>
<td>0.0398</td>
</tr>
<tr>
<td>F5</td>
<td>-0.064299</td>
<td>0.047253</td>
<td>-1.359255</td>
<td>0.1741</td>
</tr>
</tbody>
</table>
1) The regional GDP per capita coefficient is -0.14510, which indicates that regional GDP per capita is negatively correlated with the comprehensive technical efficiency of higher education resource allocation, but the correlation is not significant. In 2018, Area A is located at the bottom of the six central provinces with a GDP per capita of USD 4031, but Area A is the only capital province among the six central provinces with effective resource allocation efficiency DEA. The provinces with GDP per capita ranking in the top three are Area B, Area E and Area C, with GDP per capita 5285 dollars, 4745 dollars and 4559 dollars. However, the effectiveness of resource allocation of universities in the three provinces is lower than that in Area A. However, the per capita GDP of Areas F and D is higher than that of Area A. But the per capita GDP of Area F and Area D ranks fifth and fourth among the six central provinces, and the resource allocation efficiency ranks first and second to last among the six central provinces.

2) The coefficient of school size is 0.823184, which indicates that school size is positively related to resource allocation efficiency of colleges and universities, but the correlation is not very high. The efficiency of resource allocation in colleges and universities increases by 0.823184 when the school size increases by 1 unit. In the research, fixed assets are used instead of school size, that is, the higher the total value of fixed assets, the larger the school size. Fixed assets of colleges and universities include teaching, research instruments and equipment and asset information technology equipment assets. Before the school scale reaches the critical point, increasing the investment in fixed assets is conducive to improving the pure technical efficiency of resource allocation.

3) The teacher's power coefficient is 0.492328, which is positively related to the 5th level of higher education distribution efficiency. In this study, the teacher's level of teachers is used to represent the quality of the teacher's level in the central region. The results show that teachers have a positive effect on the work of allocating higher resources. In 2018, teachers with professional degrees in colleges and universities in Region B accounted for 41.83 of all full-time teachers, the highest percentage of 6 central states. The total number of full-time professors in colleges and universities in Region C is the highest. However, the allocation of higher education resources in Region C is lower than that in Region B.

4) Education funding indicator is positively, but not significantly, related to technical efficiency of education resource allocation. In 2018, the financial education funding indicator in Area B is the highest among the six central provinces, which has the highest value of pure technical efficiency. The empirical results show that education funding must reach the basic amount needed for educational activities, so the average education funding per student must reach the national average.

5) The scale of education funding is negatively correlated with the technical efficiency of education resource allocation. In 2018, the education funding investment in Henan of 8.16 million yuan is the largest scale of education funding among the six central provinces, and the education funding investment in Area A is 5.6198 million yuan, but the technical efficiency level of higher education resource allocation in Area C is lower than that in Area A. The empirical results show that the efficiency of higher education resource allocation in central region is not determined by education funding alone, but depends on the optimization of the resource input combination.
5 Conclusion

The per capita education expenditure is positively correlated with the efficiency value of higher education resource allocation, so the efficiency of education resource allocation should be improved to make the per capita education expenditure reach at least the national average. The research level of teachers is significantly positively correlated with the efficiency of compulsory education resource allocation, so improving the teacher strength of compulsory education is important for improving its resource allocation efficiency. The scale of investment in education is inversely correlated with the efficiency value of higher education, but the effect is not significant. Based on DEA-tobit model to analyze the allocation efficiency of higher education is to analyze the factors affecting efficiency on the basis of the relative efficiency or inefficiency of allocation. In the case of certain output, the excessive input of education funds will cause the inefficiency of resource allocation. It can be seen that universities should pay attention to the optimal allocation of resources to improve the efficiency of resource use, not only to increase the total amount of inputs.

References


