ANP - based private capital into higher education comprehensive benefit evaluation

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ABSTRACT. *On the basis of summarizing the characteristics of universities at home and abroad and our higher education standard quality system. In this paper, 34 evaluation indicators were selected, and the network hierarchical model (ANP) was applied, and the relative weight of each indicator in the evaluation was solved by Super Decision software. This paper tries to use the method of private capital into the comprehensive benefit of higher education to make scientific, reasonable and accurate assessment, so as to enhance the use efficiency of private capital and the level of running a school of higher education, to attract more private capital to participate in education, promote the combination of education and economy, improve higher education rely on the funding situation for a long time.*

Keywords: higher education; Private capital; Analytic hierarchy process (ANP); Index weight; Super Decision

1. Introduction

Capital is the power source of economic development and the strong support for creating material and spiritual wealth. Capital is also the key factor to promote the development of education. Therefore, in order to develop education in China, besides perfecting itself, we need the support of capital. In the field of education, there seems to be a natural barrier, which hinders the entry of social capital. China has been supporting the development of higher education with state financial funds, and social capital investment in education is obviously insufficient. If we want to realize the transformation from a big country of education to a powerful country of education, China's education urgently needs to embrace all rivers and open up many restrictions for private capital to invest in higher education.

Government and private capital investment have their own functions and characteristics in running schools. Government-run education is public-spirited, public-oriented and not profit-oriented. In addition to improving the cultural quality of the whole people, it also provides basic education guarantee for the lowest class of people. It enables children from special groups and poor families to receive education in order to help low-income people out of poverty, narrow the gap between the rich and the poor, and enhance legal awareness. Private education aims at making profits. Families with higher requirements for educational software and hardware in the service sector, depending on flexible and diversified school-running ideas, international school-running characteristics and high-quality education environment, serve specific groups and become another scenic line different from public education.

Due to the lack of market competition, public education began to appear contrary to the nature of education: more and more public learning schools enjoy the preferential policies of the state, but they have become high-end institutions and key universities, with their strong faculty and first-class universities. The teaching environment only recruits high-quality students, but at the same time requires private education to fulfill the "obligation" of universal education, which has severely hampered the enthusiasm of private capital to participate in education, making private capital deterred from facing the broad education market. The entry of private capital into the education sector can alleviate the government's pressure to run schools and add vitality to education. If public and private education can be clearly defined and complemented each other, it will not only provide students with more diversified choices, but also have great developments in China's education.

The development of education can not be separated from the support of the market, but the further financing of education to the market is limited at present. Because the starting point of private education is much different from that of public education, the identity of some private colleges and universities is not recognized by the society, and because of the strength of public schools themselves and the difficulty of establishing a fair competition market mechanism, the development space of private education is greatly limited. In addition, the uncertainty of the input-output benefits of private capital for higher education is also an important place to restrict the financing of education. Because. In order to develop education,

we must liberalize the restrictions of non-governmental school-running, let the market solve the relevant problems, respect fair competition, and advocate the coexistence of mutual benefits, so as to maximize the development of school-running vitality. Encouraging and supporting private capital to participate in education should not be just empty talk, but must be implemented. Therefore, it is of great theoretical and practical significance to study the comprehensive benefits of private capital entering higher education.

2. Research on the input and output of higher education

How to evaluate higher education determines the objectivity and impartiality of performance evaluation results. There are many performance evaluation methods for input and output, including factor analysis method, data envelopment analysis method, entropy weight method, comprehensive analysis and judgment method, expert scoring method, etc. Among them, factor analysis method, data envelopment analysis method and entropy weight method are quantitative evaluation methods that need data support, while comprehensive analysis and judgment method and expert scoring method are qualitative evaluation methods, but the weight of indicators should be determined. Current for the universities in our country internal control of the real data is not completely, for various reasons and purpose, colleges and universities is not willing to disclose financial statement data, even if some school choice data, also more or less after a certain amount of beautification, compared with private capital input and output data are lack in colleges and universities, so if using the method of quantitative evaluation lack some data to support.

In the early 1970s, American operations researcher Satty TL proposed the Analytic Hierarchy Process (AHP), which is used to quantify the impact factors of performance. AHP is a simple and practical multi-criteria decision-making layer. A method for solving problems, which can quantitatively describe qualitative problems. The specific principle is to divide the relatively complex factor system that affects a problem into a group with a certain relationship and order, so that the relationship between the factors It becomes clear and clear, and compares and judges the importance degree between the factors according to certain criteria. Then, combining the objective judgment criteria and expert opinions, the elements of each layer group are compared in pairs, and finally the quantitative description is given.

Although AHP is a method to quantify the factors affecting performance, its essence is indeed a subjective weighting method. The judgment matrix mainly relies on experience and intuition, which leads to the interference of index weights with subjective factors. In practice, the objective factors are complex and variable, and there is a great deal of uncertainty, which makes the importance of elements difficult to carry out smoothly. If the information contained in each indicator is not fully interpreted, the weight is given artificially. It is inevitable that there will be bias. Based on this, Rozann W.Satty and William Adams designed Super Decision software, which establishes a network association model, and combines each element group and each element group according to certain evaluation goals, and makes them related to each other. The judgment matrix of the pairwise comparison is formed between the elements, and the pairwise judgment matrix is formed into the corresponding supermatrix through software, and finally the relative importance evaluation result of each index is obtained.

Therefore, this paper first establishes the comprehensive benefit evaluation index of private capital after entering higher education, uses the network analytic hierarchy process (ANP) and SD software to determine the weight of the evaluation index, in order to objectively and impartially evaluate the contribution of the market to the development of education and the input-output efficiency of private capital to higher education, and gives the consistency test results of each hypermatrix. To prove the validity of the results. This paper can provide theoretical basis for the evaluation of input-output benefit of private capital entering higher education and the adjustment of educational policy, so that higher education in China can develop better and faster.

3. Design of Index System and Method of Determining Index Weight

(I)Index system

The research on the economic benefits of higher education is based on cost theory and human capital investment theory. Therefore, the selection of comprehensive performance evaluation indicators produced by private capital investment in Higher Education in this paper mainly focuses on four aspects, namely, input, output, internal and external economic benefits.

A. Input indicators

Investment mainly includes three aspects: human, material and financial resources. The human resources of colleges and universities are mainly the input of teachers and staff, because if the cause of higher education wants to develop, it must have a strong team of teachers. Teachers shoulder the important task of teaching and educating people, so the success or failure of education depends largely on the quantity and quality of human resources. Financial input includes annual education costs, capital construction costs and research funds, including years. Educational expenditure refers to the sum of various expenditures needed to maintain the daily operation of colleges and universities. Capital construction expenditure refers to the cost of building school buildings and purchasing large-scale teaching equipment. Scientific research expenditure refers to various expenditures for academic research. The above three indicators reflect the input status of various major expenditures every year. Material resources indicators include total building area, total value of teaching and scientific research equipment, total fixed assets and paper. The quantity of quality books, these indicators show the conditions of running a university. If the input of material resources is too little, it can not guarantee the normal teaching and scientific research, and affect the quality of teaching. If the input is too large, it will lead to low utilization of equipment and waste of resources.

B. Output indicators

Educational output includes three aspects: personnel training, scientific research achievements and student quality. Talents training includes annual enrollment, number of students in school and number of graduates; scientific research achievements include number of published papers and monographs and number of awarded scientific research achievements and patents; students'quality includes graduation rate, graduate contract rate, average starting salary line of graduates and the proportion of graduates' satisfaction or basic satisfaction. In the case of a certain input to universities, the greater the output value, the better the economic benefits, but can not blindly pursue the maximization of output, because if the conditions of running schools do not meet certain standards, if the number of students blindly increased, enlarging the enrollment scale, it will lead to a decline in the quality of graduates, can not meet the needs of economic development.

C. Internal economic benefits

Internal economic benefits include the management and use efficiency of the university's human, material and financial resources. The human efficiency includes the ratio of students and teachers, the number of teachers to the total number of faculty and staff, the proportion of teachers with master degree and the average number of teachers who receive the awards for science and education research. The financial efficiency includes the average annual needs of students. Education costs and infrastructure costs, as well as the proportion of equipment costs for teaching in the total cost of equipment purchase, and the proportion of staff funds used for faculty training; material efficiency includes the average floor area per student, per The value of teaching equipment that students can have and the number of books that each student can read, and the level of equipment utilization reflects the level of material use in schools, which is an important indicator to measure this goal. The higher the internal economic efficiency of a school, the better the school's teaching management status, and the higher the quality of teaching conditions.

D. External economic benefits

External economic benefit indicators include the contribution of colleges and universities to the economy and the services to society after private capital investment. Among them, the contribution of colleges and universities to the economy is the proportion of graduates who adapt to economic development and the contribution rate to GNP growth; the service indicators for society include the conversion rate of scientific research achievements and the number of enterprises established with the school.

Whether college graduates can adapt to the needs of economic development is an important indicator to measure the economic output of higher education. In order to develop higher education, in addition to ensuring that it has a certain amount of scale, it must also guarantee the quality of its teaching. If the graduates trained in colleges and universities can only adapt to the economic development in quantity, but can not meet the needs of the job, Affect the normal operation of the work, resulting in waste of resources and affecting the further development of the economy.

The contribution of universities to GNP growth is another important indicator for measuring external economic benefits. There are three main methods for measuring this indicator: description method, labor simplification method and production

function method. The description method is a summary of typical cases and a summary of the literature to give the value of the indicator, which is a qualitative analysis method; the simplified rule is to calculate the value of the indicator by the labor reduction factor; the production function rule is produced by Cobb-Douglas The function to determine the size of this value is a method of quantitative analysis.

The degree of service to the society does not depend on the number of scientific research projects, but depends on how many of the research projects are promoted and used. Only the scientific research projects that are promoted and used can truly serve the society, and it is also to evaluate whether the research of the school is combined with the actual situation.

(II) Determination of indicator weights

After the indicator is determined, the following software is used to calculate the weight of each indicator:

A. Comparison of importance

Since the elements of ANP cannot be completely independent, a direct or indirect comparison between each two elements is made. Direct comparison refers to the direct comparison of the importance of the two elements without measuring Other indicators; indirect comparison means that two elements are compared with the third element under the given same evaluation criterion, and this third element becomes the new evaluation criterion, that is, the secondary criterion. The former method applies to elements that are independent of each other, while the latter method applies to situations where elements are interdependent.

The importance evaluation between these indicators is based on the compilation of national social science statistics, Chinese university evaluation and China Education Statistics Yearbook. According to these data, the measurement and evaluation of higher education in all aspects, the indicators selected in this paper. Sorting, when the indicators are compared in pairs, combined with the expert opinions and index sorting results, the scale is taken to form a judgment matrix.

B. Determination of weight

(1) Forming a judgment matrix based on the comparison of importance levels A

(2) The matrix is grouped by column, that is, the sum of the columns is set to 1,

thereby obtaining the matrix B after the return.

(3) The matrix B is summed by row, and is classified into 1, and the weight of each index is obtained.

(4) Computational consistency indicators CI and RI

In practical applications, the value of RI can be obtained by looking up the table, or it can be calculated by programming according to certain algorithm steps. Since the SD software directly gives the final result, the detailed procedure is not given in this paper.

(5) Calculate the consistency ratio CR

When CR < 0.1, the judgment matrix is considered to meet the consistency requirement and no modification is required.

C. Indicator weight results

Super Decision software gives a variety of methods to input judgment values, such as questionnaires, matrices, and drawings, and compares the elements of the relationship. Then, according to the above principle, the software uses 11 layers of 4 criteria layers. The comparison between the group and its 34 elements is made, and the relationship matrix and the corresponding consistency test results are given. The critical value of the consistency indicator is 0.1. When the value is greater than 0.1, the judgment matrix is considered to be inconsistent with the requirement, and certain corrections need to be made.

A Formula for Calculating the Score of Comprehensive Evaluation of Higher Education Benefits, Based on the above results, the following scoring formulas are used to evaluate the comprehensive performance of colleges and universities after private capital investment:

$$Q = \sum_{i=1}^{34} Z_i \times R_i$$

Where Q represents the total score of the university, Z_i ($i = 1, 2, ..., 34$)

represents the weight of the i-th level three indicators, R_i ($i = 1, 2, ..., 34$)

represents the colleges and universities The i-th third-level indicator is quantified according to the unified standard. In the actual evaluation process, it is necessary to bring the index data of each university into the formula to calculate the total score. For the schools with high scores, the comprehensive economic benefits and school quality of the input and output are relatively higher than those of other schools.

4. Conclusion

A scientific, reasonable and accurate assessment of the input and output performance of private capital entering colleges and universities is related to the positive enthusiasm of private capital investment and the degree to which the state opens education to the market, which directly affects the future development of education in China, education and economy. The combination is an important way to achieve China's goal of becoming a strong country in education. Financial allocation alone cannot make education more developed. There are two most critical issues to be solved in assessing the comprehensive performance of colleges and universities: to establish an appropriate indicator system and to determine the weight of indicators. The evaluation of the input and output evaluation indicators of higher education in this paper is based on the documents of the Ministry of Education and the access to domestic and foreign university materials. On the basis of the evaluation; the weight of the indicators in the evaluation is determined by the use of the current advanced network analysis method (ANP), and the specific value is given by means of Super Decision software. This method can accurately assess the benefits of private capital entering higher education, promote the transformation of education to the market, better play the capital advantage, and contribute to the cause of China's education power.

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References

[1] Ma Dexiu (2011). Accelerate the construction of a world-class university with quality as the core. China Higher Education, 21, pp.6.

[2] Wang Xiuming Chen Mingrui(2012). Application of AHP Analytic Hierarchy Process in the Comprehensive Evaluation System of University Faculty. Journal of Hainan University (Natural Science Edition).

[3] Satty T L(1986). Axiomatic foundation of the analytic hierarchy process[J]. Management Science, Vol. 23, No.7, pp.851-855.

[4] Satty T L(2001). Desion Making with Dependence and Feedback: The Analytic Network Process. Pittburgh, RWS Publications.