



The Evaluation of Higher Education Expenditure Performance and Investment Mechanism Reform

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Abstract

Along with the reform of Chinese Government public finance, higher education belongs to the public product, gradually changes from “fund investment management” to the “expenditure performance management”. The evaluation of expenditure performance system becomes the key point of higher education investment mechanism reform. This article studies the level, mechanism, target, and method of higher education expenditure performance evaluation to explore the feasibility of establishing a unified and compared evaluation system, and carries it on the overall expenditure by the indicator system and evaluation analysis method to confirm the validity of university expenditure performance evaluation for higher education investment management. The findings show that expenditure performance evaluation is vital significant for establishing the new higher education investment mechanism based on performance by enhancing the fund investment efficiency and promoting the higher education development.

Keywords: University, Expenditure evaluation, Higher education, Investment mechanism

The questions of higher education system receive attention in china and abroad day by day. In the countries of world economics cooperation and development organization it is a recent and strong trend as a way to study the potency and efficiency of education system by comparing among countries (the world economics cooperation and development organization, 2006b). Higher education system becomes the focus as important property of knowledge society. To countries, national economical competitive power depends on the operation of these institutions.

Effective operation of higher education system needs sufficient funds and effective assignment. The nature of Quasi-public goods decides that government is an indispensable and important role in the allocation of resources for higher education; its efficiency can only be enhanced by the competitive channel provided together by the government and the market. Therefore, the competition introduced by government to substitute for original mechanism becomes the important topic of the new public administration (NPM), also it is the key for the reform of Chinese higher education investment mechanism. This article discusses two points: First, the establishment of higher education expenditure performance evaluation system is a request for the reform of Chinese higher education investment mechanism. Second, the higher Education expenditure performance evaluation can discover the key point of higher education investment mechanism reform present by quantitative analysis of expenditure performance.

1. The problem and corrective measure of Chinese higher education investment mechanism

Chinese higher education has been at the strategic prior development position and obtained great national support since 1978. Number of new entrants of higher education increases from 2,846,700 in 1998 to 5,409,400 in 2005, the range is about 90.02%. Students in university increase from 856 thousand in 1978 to 230 million in 2005. The higher education

investment also increases unceasingly, showed in Table 1, from 1999 to 2005 national financial appropriation for higher education increases at a speed of 16% per year.

Although Chinese higher education has made great progress, it still faced many questions. The main questions are the insufficiency in higher education investment and the low efficiency in funds using. Chinese have much lower public education expenditure: 2-3 percent of GDP compared to average level 6 percent in developed country and 4 percent in developing country. The budget of educational funds and public expenditure per student reduce year by year, respectively are 5375.94 Yuan and 2237.57 Yuan in 2005, meanwhile budget per university student in developed country is 4118.64 Yuan and 6004.58 Yuan in Asian developing countries. Compared with other countries, Chinese universities' scale is smaller and have lower student-teacher ratio, only 16.85:1 in 2005. There is still a great gap between china and overseas. In addition, Chinese higher education has extremely imbalanced development among various areas and low efficiency for university property using.

It needs effective investment mechanism to carry on the resources deployment for the challenge of short resources in higher education. The total national education investment is 8,418,840 million Yuan in 2005, while the budgetary investment is 4,946,040 million Yuan, accounting for 59 percent. The government allocations are still the main investment though Chinese higher education has formed the multiple pattern of investment through nearly ten years of reform. The investment mechanism of Chinese government appropriation for higher education transferred from "base + development" to the way of "synthesis fixed quantity + special subsidy" Since 1986. The reform of investment mechanism enhances the transparency of investment allocation and carries out the concrete basis of allocation in details, taking the advantage in overcoming the capriciousness of "base + development". The special project subsidy helps to accord with the goal of government's higher education policy. But the pattern does not reflect the actual cost of higher education. As the investment allocation based on the number of students, it trends to a large unreasoning scale of recruitment of students. Also the pattern has many inflexible factors, lacking effective promotion to the school behavior, and does not benefit elevation, characteristic formation and innovative production. Thus, the question remains, the higher education investment mechanism needs optimization design to solve these problems.

Compared with the increment allocation pattern and the special project allocation pattern, the performance evaluation pattern relatively has more superiority. It is easier to introduce the competition, making government pay more attention to the university's scientific research allocation and the effect performance of the scientific investment for university. Of course, the performance has included the efficiency, the product and the quality, the contribution and service which the organization provides. For example, with standard performance evaluation system, countries like Sweden, Canada, and Britain who carried out power and responsibility accounting system by reflecting completely budget information and cost with social surveillance, form a set of quite perfect effect management system (Wang Mingxiu and Sun Haibo, 2005). The United State promulgated "Government Performance and Results Act" in 1993 (GPRA), starting the government effect reform. Australia implemented "Financial Management Improvement Program" (FMIP) in 1984 as similar reform for the purpose of improving the Australian Government's management performance and pecuniary condition. Performance evaluation becomes the new tendency of investment mechanism reform because more and more countries finance management changes to guarantee the performance.

Chinese government also started "performance as the guidance" for the reform of expenditure management system in recent years. The Ministry of Finance requested some provinces to carry on the expenditure performance evaluation exercises on small scale successively in the latter half of 2001, like HuBei, HuNan, HeHei, FuJian provinces and so on. The Ministry of Education organized experts to conduct the related university expenditure evaluation research in 1998 and 2000. The undergraduate student teaching evaluation of Ministry of Education includes four items of funds as the target for university evaluation; Level 'A' requests four items of funds above 30 percent of tuition income of university. The higher education investment gradually changes from "fund investment" management to "expenditure performance" management. Thus the higher education expenditure performance evaluation is not only a way for university internal expenditure management, but also a way for the exterior managers or the benefit counterparts to measure the overall higher education investment performance. Chinese higher education investment mechanism should analyze the university expenditure, measured by a group of multi parameter evaluation system to reflect the expenditure performance, to make sure that Chinese higher education's investment mechanism has manifest fair, transparent and efficiency principle and enhances the benefit of resources deployment.

2. The goal, principle, target and system of Chinese higher education expenditure performance evaluation

The goal of higher education expenditure performance evaluation is to establish an effective expenditure evaluation system, raise the efficiency of financial funds, and change gradually from investment management to expenditure management (Wang Mingxiu and Sun Haibo, 2005). The higher education expenditure performance evaluation should study the enterprise formulation principle, following the scientific, integral, comparable and feasible principle (luYuan, 2006). The higher education expenditure performance evaluation should show manifest fair and the efficiency, with covering educational expenditure situation, the goal of educational expenditure, the compliance of educational

expenditure, the immediate influence of educational expenditure and the indirect influence of educational expenditure.

Usually the design of higher education expenditure performance includes: comprehensive strength, functional performance and financial potential. Comprehensive strength includes financial indicators and the non-financial indicators, the former including gross income of university, government appropriation for higher education, self-provide income of university, the income of scientific research activity and income of teaching activity and so on; the latter divides into the discipline construction evaluating indicator, the scientific research evaluating indicator, the personnel training evaluating indicator and the troop construction evaluating indicator. The functional performance includes education evaluation indicator, capital construction evaluation indicator and the equipment evaluation indicator. The education evaluation indicator is composed by student-teacher ratio, average expenditure per student and average research spending per teacher; Capital construction evaluating indicator covers the accomplished plan of the year, the rate of capital investment finished, the rate of budgetary allocation; The equipment evaluating indicator is measured by the proportion of equipment expenditure in gross expenditure, the rate of instrumentation equipment. With the loan sum, deposit sum at the end of year and asset-liability ratio, financial indicators reveals the potential development of university based on the risk analysis and synthetic evaluation.

Because the partial target data origin is not easy to obtain, this article designs the major targets of higher education expenditure performance evaluation system based on the statistical data of China Statistical Yearbook and China Educational expenditure Statistical Yearbook .(see Table 2)

3. The indicator and data of higher education expenditure performance evaluation

3.1 Performance evaluation indicator system

The higher education expenditure has characteristics of multiplicity, multi-level, macroscopic and externality which decides the expenditure performance evaluation to pay attention not only to its efficiency, but also to its sociality and environment. This paper selects 12 evaluation indicators under the support of available statistic data, (See Table 3) and looks at the data of Chinese over 9 years, 1997-05. (See Table 4) A-L is used to proxy 12 evaluation indicators. The contribution of higher education to the economic growth rate in China is obtained by the estimate method of Cui (2000), other data is obtained on the basis of computation of related yearbooks. The scale of education expenditure indicators may reflect how dept and wide the government involves into the social higher education; The structure of educational expenditure is helpful to show the influence of different expenditure to the education; The effect of education expenditure may indict the contribution of higher education to macro economic, labor force and education condition under certain scale and structure of education expenditure.

3.2 Evaluation Method

It should use objective evaluation method primarily to investigate the summary evaluation of past higher education expenditure condition. The weighting factor evaluated by subjective assessment is decided to a great extent by expert's knowledge, experience and preference. When the relative important of each evaluating indicator is unable to give clearly, it has to make full use or excavate the information provided by whole data to get objective results. This article determines the weight factors by the comprehensive approach of "scatter-degree" (Guo Yajun,2002), where factors can be obtained by overall data between the difference object.

The available primitive observed data of Chinese higher education expenditure condition of nine years of 1997-05 is described by $\{X_{kj}\}$ ($k=1,2, \dots, 9; j=1,2, \dots, 12$) (where X_{kj} represents the proxy for primitive observed value of indicator j in the year of k). Furthermore, non-dimension process and unified formulation process of the primary data is used to make the results objective (Guo Yajun, 2002), then the synthetic evaluation value is

$$y_k = \sum_{j=1}^{12} w_j x_{kj}; k = 1,2, \dots, 9 \quad (1)$$

Where w_j represents the weighting factor of x_j . The principle of weighting factor confirmed is to show the greatest difference of the different year overall. This kind of difference can be obtained by the maximum of Sum of squares of y_k , it can be proved, $\sum_{k=1}^9 (y_k - \bar{y})^2 = W^T H W$. In the formula, $W = (w_1, w_2, \dots, w_{12})^T$; $H = X^T X$;

$$X = \begin{bmatrix} x_{11}, x_{12}, \dots, x_{1,12} \\ x_{21}, x_{22}, \dots, x_{2,12} \\ \dots \quad \dots \quad \dots \quad \dots \\ x_{91}, x_{92}, \dots, x_{9,12} \end{bmatrix} \quad (2)$$

If we do not limit W , the formula may get unlimited value. It is defined $W^T W = 1$ (i.e. $W_1^2 + W_2^2 + \dots + W_{12}^2 = 1$)

here for the convenient of computing. By now, the question of w_j is concluded to:

$$\max W^T H W, s.t. \|W\|_2 = 1, W > 0 \quad (3)$$

3.3 Results and analysis

Use MATLAB6.5 to get the Results: $w_1=0.0431$, $w_2=0.1348$, $w_3=0.1559$, $w_4=0.1237$, $w_5=0.1736$, $w_6=-0.1092$, $w_7=-0.1032$, $w_8=0.1655$, $w_9=0.1670$, $w_{10}=0.1501$, $w_{11}=-0.0642$, $w_{12}=0.1628$ by the formula (3). We substitute w in the formula (1) with the result value, and obtain synthetic evaluation value of Chinese educational condition over 1997-2005. (See Table 5)

Table 5 gives a picture of evaluation value. Figure shows Chinese education expenditure is improved with synthesis condition of expenditure scale, structure and effect. Chinese synthetic evaluation value of 2005 is the 1.49 times of 1997. Especially the number of students in university rises year by year, evaluation value of university student in the resident of 2005 is the 2.63 times of 1997, the evaluation value of rate of undergraduates in worker population of 2005 is 3.15 times of 1997, showing Chinese higher education enhanced the quality of labor obviously. China proposed the reform of higher education popularity plan in 1999 and took national higher education into a superior development phase. So the entrants of higher education rise, relative teacher quantity increases, the personnel funds and the public expenditure grow with the teacher treatment enhances. It shown in table 5 that the evaluation value of personal funds proportion of 2005 is the 3.45 times of 1997 and the evaluation value of public expenditure proportion of 2005 is the 1.67 times of 1997.

At the same time, the result of Table 5 suggests Chinese higher education investment mechanism still need improved. Evaluation value of capital construction expenditure of 2005 is only 0.41 times of 1997, indicating it is not optimistic. Though the budgetary part is declining, the overall capital construction is still at ascent stage, the proportion of the budgetary capital construction expenditure accounts for the capital construction expenditure reducing from 42.40% in 2000 to 23.33% in 2005. This implies that massive capital construction sources comes from the bank loan, which increased the university financial risk. The result also shows that increases of research expenditure do not improve achievement obviously. The scientific research still needs strengthen as well as reform of investment mechanism.

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Table 1. Chinese Higher Education Funds Investment and Number of New Entrants

Year	Government Appropriation for Higher Education (100 million Yuan)	Compared to last year (%)	Number of new entrants of higher education (10 thousand person)	Compared to last year (%)
1999	2287.18	12.53	284.67	146.23
2000	2562.61	12.04	389.61	36.86
2001	3057.01	19.29	480.73	23.39
2002	3491.40	14.21	563.08	17.13
2003	3850.62	10.29	409.06	-27.35
2004	4465.86	15.98	479.97	17.33
2005	5161.08	15.57	540.94	12.95

Source: The Chinese Ministry of Education website, the Ministry of Education, the State Statistical Bureau, 1998-2005 national education expenditure operational practice statistics announcement issued by the Ministry of Finance.

Table 2. The Expenditure Evaluation Indicator System

Evaluation Content	Evaluation Indicator
Funds Structure	The Rate of Budgetary Educational Income in Government Revenue
	The Rate of Budgetary Educational Expenditure in Government Expenditure
Funds Using Structure	Education Expenditure per Student: Books Expense per Student, Instruments Expense per Student, Network Cost per Student
	The Rate of Personnel Expenditure in Budgetary Expenditure
	The Rate of Public Expenditure in Budgetary Expenditure
	The Rate of Research Expenditure in Budgetary Educational Income
	The Rate of Capital Construction Expenditure in Budgetary Expenditure
Education Contribution	The Contribution of Higher Education to The Economic Growth Rate
Education Achievement	Graduation Ratio
	The Number of University Student per Thousand Population
	The Rate of Undergraduates in Workers
	The Number Every hundred teachers, students attain prize
Scientific Research Effect	The Number of Teachers Engaged in Science, No of Papers Published Per Teacher and Student, Income from License Arrangements
School Condition	Each student area, each student teaching with the room area, each student hold the books and reference materials and the teaching test installation quantity and so on
Professional education ability	Specially appointed teacher quantity and structure: The specially appointed teacher accounts for all teaching and administrative staff proportion, the high-level title to account for the teacher total number of people proportion, the student teacher proportion
	Discipline degree points quantity, plan curriculum start rate, school grades finish rate
Financial ability	The expansibility expenditure accounts for the gross charge proportion, asset-liability ratio , the quick ratio

Table 3. Expenditure Evaluation Indicators

Evaluation Class	Evaluation Indicators
The Scale of Expenditure	The rate of Budgetary Educational Income in Government Revenue
	The rate of Budgetary Educational Expenditure in Government Expenditure
Expenditure structure	The rate of Personnel Expenditure in Budgetary Expenditure
	The rate of Public Expenditure in Budgetary Expenditure
	The rate of Research Expenditure in Budgetary Educational Income
	The rate of Capital Construction Expenditure in Budgetary Expenditure
Expenditure Achievements	The Contribution of Higher Education to The Economic Growth Rate
	The rate of Undergraduates to Workers
	The number Every hundred teachers, the student attain the prize
	student-teacher ratio
	Pieces of papers issued per teacher
	The building area per student

Table 4. The Data of Expenditure Evaluation Indicators

Year	A	B	C	D	E	F	G	H	I	J	K	L
1997	3.29	2.79	44.22	34.58	18.56	9.04	0.52	4.82	2.40	10.87	0.58	0.50
1998	3.23	2.49	46.23	33.91	19.86	9.98	0.59	5.19	3.10	11.62	0.60	0.55
1999	3.35	2.53	48.41	33.10	18.49	9.36	0.65	5.94	4.30	13.37	0.67	0.64
2000	3.41	3.09	51.55	33.66	14.79	8.79	0.58	7.23	5.30	16.30	0.65	0.81
2001	3.42	3.12	54.47	33.36	12.17	8.13	0.63	9.31	6.00	18.22	0.65	0.94
2002	3.57	3.07	53.60	34.69	11.71	7.84	0.58	11.46	6.80	19.00	0.63	1.20
2003	3.46	3.15	52.93	35.80	11.28	8.42	0.51	12.98	7.23	17.00	0.59	1.42
2004	3.31	3.07	52.87	36.59	10.54	8.28	0.46	14.20	6.78	16.22	0.56	1.58
2005	3.13	2.80	53.38	37.27	9.35	9.58	0.47	16.13	6.63	16.85	0.57	1.81

Source: Network Statistics Database, China Statistical Yearbook, China Educational Expenditure Statistical Yearbook, China Educates Statistical Yearbook.

Table 5. Chinese Higher Education Expenditure Synthetic Evaluation value and Order over 1997-05

Year	1997		1998		1999		2000		2001		2002		2003		2004		2005	
	Val	Sort	Val	Sort	Val	Sort	Val	Sort	Val	Sort	Val	Sort	Val	Sort	Val	Sort	Val	Sort
A	2.49	7	1.97	8	3.00	5	3.48	4	3.54	3	4.77	1	3.86	2	2.65	6	1.22	9
B	2.54	7	1.30	8	1.48	7	3.78	3	3.90	2	3.70	4	4.01	1	3.70	5	2.59	6
C	1.08	9	1.66	8	2.29	7	3.20	6	4.05	1	3.80	2	3.60	4	3.59	5	3.73	3
D	2.86	5	2.38	6	1.80	9	2.20	7	1.99	8	2.94	4	3.74	3	4.31	2	4.79	1
E	4.20	2	4.55	1	4.18	3	3.19	4	2.49	5	2.36	6	2.25	7	2.05	8	1.73	9
F	3.31	4	4.70	1	3.79	3	2.95	5	1.98	8	1.55	9	2.40	6	2.20	7	4.11	2
G	2.55	6	3.59	3	4.48	1	3.36	4	4.21	2	3.36	5	2.29	7	1.51	9	1.66	8
H	1.76	9	1.86	8	2.05	7	2.37	6	2.90	5	3.45	4	3.83	3	4.14	2	4.63	1
I	1.19	9	1.61	8	2.34	7	2.94	6	3.37	5	3.85	2	4.11	1	3.84	3	3.75	4
J	1.29	9	1.57	8	2.21	7	3.30	5	4.01	2	4.30	1	3.56	3	3.27	6	3.50	4
K	2.27	7	2.68	5	4.51	1	4.12	2	4.06	3	3.42	4	2.48	6	1.57	9	1.88	8
L	1.77	9	1.89	8	2.08	7	2.47	6	2.76	5	3.33	4	3.83	3	4.17	2	4.70	1
M	39.03	8	36.68	9	38.6 9	7	48.3 4	6	51.6 9	5	57.3 7	4	59.4 2	3	60.6 0	1	58.2 0	2