

# An Empirical Study on the Construction of a Higher-Education Performance Allocation Model

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**Abstract:** China's financial input mechanism reform's current development trend involves fully implementing budget performance management and constructing a performance-oriented financial allocation model. These are also essential measures in promoting the modernization of the national governance system and governance capacity. The current financial allocation method for higher education entails a financial supply policy based on per-student appropriation. A new performance-oriented system of higher-education financial allocation system is necessary to upgrade the per-student appropriation of a single flow, construct a close loop of financial allocation "fund flow," optimize the allocation of financial resources for higher education, and guide higher-education institutions to deepen comprehensive reform and achieve high-quality development. Based on the actual situation and relevant data of 26 undergraduate universities in Jiangsu of China, this paper proposes a "double dimension" higher-education performance funding index system, conducts an empirical study with the data envelopment analysis model, and suggests policies on the construction, organization, and implementation of higher-education performance allocation models.

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## Defining the Problem

**S**INCE the 1980s, the financial system of higher education in developed countries has undergone significant changes, with the financial crisis and the decline in competitiveness caused by higher education's popularization. On the one hand, cost consciousness was enhanced. Based on the cost-sharing theory, a cost compensation mechanism was established at the national level to promote diversified funding sources for colleges and universities. Some countries that did not collect tuition fees have now begun to do so. Tuition fees and donations constitute a large share of many public universities' total income, with some reaching 30%-40%.

On the other hand, the appropriation mode changed. Guided by the focus on output and efficiency, financial resources allocation pays more attention to a university's actual output and performance. The traditional financial allocation method in a university is mainly based on the number of registered or enrolled students, which is appropriate for elite education. It involves a small number of students or a financial supply with a single funding source. However, because of changes in higher education and financial allocation trends, such a traditional allocation method has failed to meet higher-education development's practical needs. People pay more attention to performance, efficiency, and responsibility than ever. In this case, the introduction of performance mechanisms into higher education resource and financial allocation models has become an inevitable developmental factor.

The current financial allocation method for Chinese higher education constitutes a financial supply policy based on per-student appropriation. According to the student population, allocating funds may result in the unreasonable pursuit of large-scale enrollment, which is not conducive to promoting higher education development. National education fund statistics show that in 2017, the total national higher-education fund input was 1,110.9 billion CNY, of which 80% was national financial education funds. The average education cost per student in public colleges and universities reached 33,481 CNY, which was the highest among all education types. From a fund management perspective, the funds allocated to education by finance at all levels are "flowing" from high to low and are diverted or converged into specific education units. Such "fund flows" are always unidirectional. While some problems have recently been found in the audit and inspection of education funds, funding allocation, and education performance are not relevant because of the lack of suitable information feedback channels. A new performance-oriented system of higher-education financial allocation is paramount to upgrade the single-flow per-student appropriation, construct a close loop of financial allocation "fund flow," and guide higher-education institutions toward comprehensive reform and high-quality development by conveying clear policy and performance orientation, thus optimizing the allocation of financial resources for higher education.

## Literature Review

## ***Research on Foreign Higher-Education Financial Appropriations***

In the 1960s and 1970s, Western countries achieved vigorous development in higher education, and with its popularization, the student count in colleges and universities surged, dramatically increasing the average cost per student. However, the growth rate of financial education funds in various countries started to decline, followed by the emergence of supply-demand conflicts, making the financial crisis a global problem in colleges and universities. The same period also saw the rise of the public management movement, which advocated public response and proposed introducing corporate management or market approaches into government management reforms, improvements in government service efficiency, and emphasis on the increase in the quality and efficiency of fund allocation. Under this reform movement's influence, an increasing number of citizens, government officials, experts, scholars, and other stakeholders changed their monetary fund allocation concepts. They began paying attention to colleges' and universities' efficiency and responsibility with the hope that they would explain their use of funds. In this context, the traditional allocation model, which was based on colleges' and universities' student populations, was no longer able to adapt to higher education development. In contrast, the performance allocation model, which emphasized results and efficiency, began to show its superiority (Zhang & Sun, 2014a; 2014b).

Financial input systems, education management methods, and government policy orientation vary according to country, resulting in distinct forms of implementing performance appropriation. They can be categorized into three: First, they are near related to educational output and are generally linked to the number of students and the learning process. Such appropriations are generally dominated by teaching allocations. For example, in its 1992 higher-education reform, Denmark introduced a performance allocation mechanism and implemented the "taximeter model" based on the valid number of students, which was the basis for its teaching allocation and which effectively promoted the quality of students (Yang & Liu, 2017; Academy of Finland, 2014). Another example is the Dutch government's introduction of the performance grant model (PBM) in university grants in 2000. The PBM is a distribution model in which the ministry of education first determines the total budget allocated to all universities and the distributed amount. In the total budget, the teaching aspect is mainly based on the performance allocation mechanism, which accounts for about 35.8% of the school's total funding. Second, performance appropriation has a close relation with performance evaluation results. It is generally connected to a particular university area's performance, which is seen as a management tool in most countries. For example, in 2003, Hesse-Darmstadt in Germany implemented budget reform in which all higher-education institutions received a total allocation based on evaluation results. Different universities have different index weights.

Meanwhile, through a budget consultation, the Austrian government signed a three-year performance agreement with each of its universities to clarify the tasks they should undertake as a public service provider and as representatives of national interests.

The higher-education structure fund will be determined according to the quality and performance objectives stipulated in the agreement. In the United States, the Student Achievement Initiative was launched in Washington in 2008 and was formally implemented in 2009. It was based on achievement points and appropriated performance funding through additional resources based on unchanged primary allocations. Third, performance allocation is closely tied to governments' strategic demand, generally taking project funding for excellence. "Excellence" programs at the national level such as the German Universities Excellence Initiative in Germany, the Investment for the Future program in France, the Research Excellence Framework of the United Kingdom, among others, motivate universities to participate in international competition and improve the quality of higher-education research and teaching through substantial financial support.

The development of performance funding underwent a tortuous process, from rising to decline and then toward revival. For example, the United States' performance appropriation system's development can be divided into two stages. The initial stage began in 1989 in Tennessee (Li, 2016; Tennessee Higher Education Commission 2015) and ended in the economic recession of 2000. The second phase is the revival, which began in 2008 and is ongoing. According to the research results of Dougherty et al., (2013) about two-thirds of these new performance appropriation projects are re-adoptions of projects suspended in the first phase. Some projects no longer use the method of setting additional performance appropriation bonuses; instead, performance funds are embedded in state higher education allocation. The amount of funds is higher, which is generally 5% to 25% of the total state public higher-education appropriations. The most prominent among these is Tennessee, where student output-related performance funding constitutes 85%-90% of state public higher education (Dougherty & Reddy, 2013).

Similarly, European countries have also experienced two development stages in their performance allocations. The first occurred in the 1990s, when some governments such as in Denmark, Nordrhein-Westfalen in Germany, Italy, Portugal, and Sweden introduced performance allocations. Meanwhile, the second stage began at the start of this century, when France, Hesse-Darmstadt in Germany, Switzerland, and other countries introduced performance appropriation. Some countries adjusted their form of performance appropriation in the performance appropriation process from rising to decline to revival. In general, since the performance allocation system has undergone two rounds of development, the current implementation process in these countries is rational and objective without overstating performance allocation effectiveness. They can objectively view performance allocation and analyze the actual impact of its policies.

Combining the practice and experience of foreign higher-education performance allocation, we found six characteristics. The first involves paying attention to output and efficiency orientation. Here fund allocation and performance evaluation are combined organically, focusing on the use benefit of funds and the moderate embodiment of benefits in fund allocation to realize the closed cycle of "fund flow." The second entails the general use of "number of qualified students" rather than "number of

enrolled students.” The number of qualified students trained by the school and met graduation requirements shall be the reference for fund allocation. This prevents schools from unduly pursuing enrollment expansion, regardless of students’ quality and cultivated ability, to fight for funds, conducive to schools’ rational scale expansion. The third involves placing great importance on teaching quality and student growth. This “student-oriented” outlook adopts a personalized, differentiated reward model, assistance, and training combining production and teaching with research. From the perspective of student growth and learning to behave oneself, management links on fund allocation and use are scientifically designed to reflect a people-oriented approach. The fourth is the establishment of “buffer agencies.” Many countries have set up intermediary agencies or buffer organizations between their governments and colleges and universities to provide a scientific basis for government decisions on general and special appropriations, as well as to prevent the government from excessively intervening in universities, which is beneficial to the autonomous operation of schools. The fifth is the introduction of third-party assessments. Evaluations on performance or quality are generally provided by a third party, which ensures fairness and justice and promotes colleges’ and universities’ independence as the state exerts its influence. The sixth involves focusing on vertical incentives to avoid horizontal competition. Colleges and universities are encouraged to improve their performance level vertically and avoid horizontal competition for funds. This emphasizes that universities must expand their funds rather than compete for the same “cake”.

### ***Research on Domestic Higher-Education Financial Appropriations***

China’s higher-education financial allocation model has undergone three developmental stages. In the first stage (before 1985), the state implemented the “base + growth” allocation model. Under weak state financial circumstances, small scale of colleges and universities, and a relatively simple school structure in a planned economy system at that time, the appropriations system was relatively simple and feasible. However, human factors were easily influenced and did not stimulate colleges’ and universities’ enthusiasm to run schools. In the second stage (1986–2009), the state implemented the “comprehensive quota + special subsidy” allocation model, which enhanced fund allocation fairness and was relatively close to colleges’ and universities’ actual situation. However, the determination of personnel funds and public funds of various schools was mainly based on historical data, and to some extent, the allocation of special subsidies was also subjective. During this model’s implementation, some regions with limited financial resources adopted the “quota subsidy + special subsidy” model. In the rapid development of colleges and universities, it was not easy to guarantee their standard funding requirements. In the third stage (2010 onward), the state began to implement the “students’ average budget expenditure + special subsidy” allocation model. The Outline of National Medium-and Long-Term Program for Education Reform and Development (2010-2020) proposes that “all localities shall, according to the basic stand-

ards of the state for running schools and the basic needs of education and teaching, formulate and gradually raise the basic standards for the per capita funding of schools at all levels within the region and the basic standards for the per capita financial allocation of students.” In 2010, the Ministry of Finance and the Ministry of Education issued the “Opinions on Further Improving the Level of the Student Average Appropriation for Local Universities and Colleges” and, in 2014, issued the “Opinions on Establishing and Perfecting the Reform-oriented and Performance-oriented Student Average Allocation System and Accelerating the Development of Modern Higher Vocational Education,” further improving the investment mechanism for local higher education, establishing a performance evaluation system, and improving the scientific and refined education fund management (Yaozhong, 2014).

Domestic scholars have used empirical research methods to study higher-education performance allocations. Based on the reality higher-education development in China, Zhang et al. (2013) designed a budget performance evaluation index system for colleges and universities, which comprehensively takes into account their functions, namely, teaching, scientific research, social services, and cultural inheritance and innovation. According to input and output, a financial input budget performance evaluation system for colleges and universities was established (Youtang et al., 2014), consisting of 8 first-level indicators and 43 second-level indicators. Through empirical analysis, Yan (2014) found that the major indicators contributing to the performance of education fund input in higher vocational colleges are the registration rate of new students, teacher construction achievements, and teacher construction input, as well as indicators in terms of crucial specialty construction, social training, and social donation (Liangang, 2014). Gong and Chen (2017) applied the DEA method to calculate the performance evaluation of 34 higher vocational colleges’ inputs and outputs in a Western province. They concluded, among others, that the government mainly bears the allocation of education funds for public higher vocational colleges from the central to the local level. Because of the lack of participation of higher vocational colleges and relevant social departments in the appropriations decision-making process, budget preparation cannot comprehensively reflect schools and society’s actual needs..

Meanwhile, most financial allocation methods are based on the students’ count, which cannot truly reflect a school’s actual operational costs and output benefits, resulting in a disconnect between the current funding and school performance (Lianxi & Enlun, 2017). Pan (2017) believed that the “input-output” theory is the simplest and most commonly used method for performance evaluation in colleges and universities. However, the indicator weight is generally set in the study using the expert evaluation method or the mathematical analysis method, the former having unavoidable subjectivity while the latter being limited by data acquisition issues. The establishment of the coefficient of variation in mathematical analysis requires data samples of an extensive period to be accurate.

## **Study Limitations**

Through literature research, we found that foreign research on the higher-education performance allocation system started earlier and has led to relatively mature experience and models that cannot be indiscriminately adopted in China. Concurrently, while the foreign performance allocation system is also continuously improving, its effects need to be further verified and recognized. Domestic research in China is still at its initial stage, focusing on educational performance, input performance, and other factors. It is a kind of “ex-post” performance evaluation. Performing in-depth and systematic theoretical and practical research is vital to figure out ways to organically link performance with budget or per-student appropriation, establish a scientific college performance allocation system, and persuade third-party social organizations to engage performance evaluation.

## **Models, Samples, and Data**

### ***Model Construction of Higher-Education Performance Appropriation***

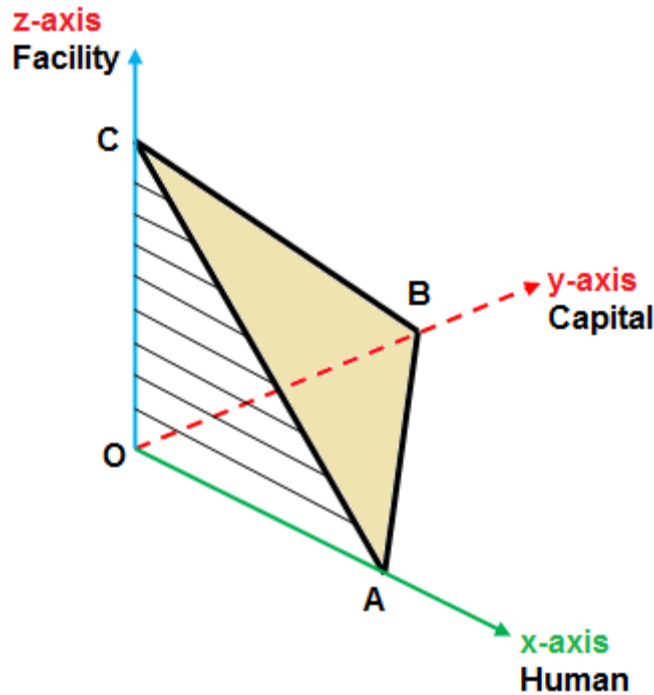
Colleges and universities exist in large numbers with various types. Although colleges and universities with different types and orientations provide higher education, they have different input levels, service objectives, and operating schools’ motivations. A set of performance evaluation index systems is not enough to measure all colleges’ and universities’ educational performance levels.

This paper proposes a “double dimensions” higher-education performance allocation index system. The educational performance is decomposed into two dimensions of “input” and “output”, each of which includes 3-4 evaluation aspects, thus constructing a multidimensional index system.

Specifically, the “double dimensions” higher-education performance allocation index system is an “evaluation box” formed by three dimensions and four planes. As shown in **Figure 1** below, evaluation index types are divided into: input and output. The former involves three evaluation dimensions (human input (x-axis), capital investment (y-axis), and facility input (z-axis)). At the same time, the latter consists of four projection planes (personnel training (OAB plane), scientific research (OBC plane), social service (OAC plane), and cultural inheritance (ABC plane)). To assess a university’s educational performance is to put it in an “evaluation box” composed of these dimensions and planes. Considering a university’s actual educational effects from different aspects, we can evaluate the number of funds allocated to a university in the next financial allocation cycle.

Compared with the typical performance evaluation index system, this “double dimensions” higher-education performance allocation index system has three characteristics. First, it evaluates the current situation. It is an assessment based on the status quo of “input” and “output.” For the evaluation object, the amount of input and output is a factual situation that has existed objectively in the past that is determined. Second, it is an objective evaluation. Specific performance evaluation indexes are given from two





**Figure 1. Diagram of Higher-Education Performance Funding “Evaluation Box.”**

dimensions: “cost input” “performance output.” Each specific index’s weight does not need to be set manually, significantly reducing the performance evaluation’s subjectivity. Third, it is a kind of data evaluation. The selection of an evaluation index mainly considers whether there are standardized and impartial data collection channels. The data should have statutory force and must be collected regularly through official channels comparable with previous years, conducive to the long-term development of performance evaluation.

### ***Sample Selection and Data Source of Higher-Education Performance Funding***

- **Sample Selection**

The scientific selection of samples and matching the corresponding data set based on the model’s index design and measurement requirements are essential in performance evaluation. This paper selected 26 ordinary universities in Jiangsu Province to confer

master and doctoral degrees based on the scope of higher-education performance funding and data requirements.

- **Major Index Selection**

Considering that the research objects are mainly universities with postgraduate training qualifications, in order to facilitate empirical research, we simplified the performance evaluation indicators. We selected the eight indicators that are most closely related to input and output, as shown in **Table 1**, to construct the performance allocation “evaluation box.”

- **Data Source**

Based on the research needs and the principle of comparability of evaluation results, the index data mainly came from three aspects: (i) the Statistics of Higher Education Undertakings in Jiangsu Province (2012-2016), which covered personnel composition, fixed input, infrastructure, and student training data; (ii) the Statistics of Finite Index of Scientific and Technological Activities in Universities and Colleges in Jiangsu Province (2012-2016), which covered teachers and scientific and technological personnel, science and technology funds, subject patents, monographs, technology transfer, and others; (iii) the Database of Statistical Statements on Educational Funds in Jiangsu Province, which covered data on the income and expense of educational funds in colleges and universities. These data were all normalized statistical projects arranged and carried out at the national level. This study used the five-year data to evaluate and analyze the educational performance of the sample universities.

## **Empirical Results Analysis**

### ***Method Selection of Performance Evaluation***

To systematically present the evaluation process and higher-education performance results, we adjusted and processed the index system according to the principles and methods described earlier and chose the data envelopment analysis (DEA) method as the primary research tool. Using the DEA non-radial method to build a model, the incremental potential of output factors in higher education is measured, and each output factor's efficiency status is clarified. Then, each higher education's educational performance is studied, and the ineffective sources are mined to guide higher education better to improve its educational performance. The DEA method is mainly used to evaluate the production (or management) performance of multiple decision units with multiple inputs and outputs. It can avoid many difficulties caused by seeking weight due to different index dimensions, with relatively objective evaluation results. In the DEA model, it is unnecessary to give input and output the weight coefficient in advance, reducing human factors' influence.

**Table 1. Evaluation Index System of Higher-Education Performance Allocation.**

The Indicator System	Main Indexes	Index Matrix Composition
Cost Input	Human Input	Number of doctoral and master supervisors ( $X_1$ ), Scientific and Technological activity personnel ( $X_2$ )
	Capital Investment	Funds allocated from public finance budgets for education ( $X_3$ )
	Facility Inputs	The construction area of school buildings with property rights ( $X_4$ )
Performance Output	Personnel Training	Number of graduate students with master's and doctoral degrees ( $Y_1$ )
	Scientific Research	Total number of Science and Technology Topics ( $Y_2$ ), number of academic papers published in foreign and national journals ( $Y_3$ )
	Social Service	Actual revenue from technology transfer ( $Y_4$ )
	Cultural Inheritance	Temporarily no

**Table 2. The Ratio and Average Efficiency of Input-Output Variables Can Be Optimized From 2012 To 2016.**

Year	Number of Graduate Students with Master's & Doctoral Degrees		Total Number of Science & Technology Topics		# of Academic Papers		Actual Revenue from Technology Transfer	
	$\beta 1$	E1	$\beta 2$	E2	$\beta 3$	E3	B4	E4
2012	0.118	0.945	0.118	0.938	0.948	0.886	15.909	0.730
2013	0.156	0.918	0.095	0.947	0.260	0.893	31.210	0.720
2014	0.393	0.873	0.148	0.909	0.584	0.834	20.442	0.587
2015	0.091	0.944	0.156	0.930	0.586	0.851	19.010	0.714
2016	0.288	0.899	0.199	0.885	2.153	0.746	68.929	0.585
Average	0.209	0.916	0.143	0.922	0.906	0.842	31.100	0.660

## ***Result Analysis of Higher-Education Funding Performance Evaluation***

### **• Performance Growth Potential Analysis**

In **Table 2**,  $\beta$  represents the proportion of the output requirement that can be increased, and  $E$  represents the output factor's corresponding efficiency. As can be seen from the table below, the four performance output indicators of the 26 sample universities and colleges, namely, the number of graduate students with master's and doctoral degrees, the total number of Science and Technology topics, the number of academic papers, and the actual revenue from technology transfer within five years are 0.209, 0.143, 0.906, 31.100, and the efficiency values are 0.916, 0.922, 0.842, and 0.660, respectively. This indicates that under the premise of constant input, the number of master's and doctor's degrees awarded and the total number of scientific and technological topics need to be improved in a relatively small space, and both the number of academic papers and the output of technology transfer has a large room for improvement, especially the income from technology transfer. This shows that universities should pay more attention to transforming scientific and technological achievements while pursuing academic research.

### **• Comparative Performance Analysis**

The higher the educational performance, the closer it is to 1, the better the educational performance. If the educational performance is 1, the school's educational output is sufficient. In **Table 3**, only five universities, including NJU, SEU, HHU, JU, and NJNU, produced significant results in terms of the average five-year performance of 26 universities. Eight universities produce between 0.9-1.0, four universities produce between 0.8-0.9, two universities produce between 0.7-0.8, five universities produce between 0.6-0.7, and two universities produce between 0.5-0.6. In 2012, 2013, and 2015, the number of universities with effective performance was more than 50%, and in the other two years, it was less than 50%. It shows that the output of higher education in Jiangsu province is invalid in some years, especially in 2016; there were only 11 universities with effectual output, accounting for 42.3% of all universities in Jiangsu province.

### **• Analysis between Performance and Funding**

In this paper, we built the "double dimensions" higher education funding performance evaluation index system. The purpose was to study puts forward the "funds and education performance correlation degree is not high," the creative thinking of the problem, which will be reflected in the government performance evaluation results of university funding allocation mechanism, build "funding-performance-grant" funding "flows" closed loop. Through the discussion and analysis of the educational performance evaluation results of 26 universities from 2012 to 2016, we proposed to calculate and deter-

**Table 3. Jiangsu Higher Education Performance from 2012 to 2016.**

University	2012	2013	2014	2015	2016	5-yr Average
NJU	1.000	1.000	1.000	1.000	1.000	1.000
SEU	1.000	1.000	1.000	1.000	1.000	1.000
HHU	1.000	1.000	1.000	1.000	1.000	1.000
JU	1.000	1.000	1.000	1.000	1.000	1.000
NJNU	1.000	1.000	1.000	1.000	1.000	1.000
NUIST	1.000	1.000	1.000	1.000	0.845	0.969
NJAU	0.784	1.000	1.000	1.000	1.000	0.957
CPU	1.000	1.000	0.741	1.000	1.000	0.948
JSU	1.000	1.000	1.000	1.000	0.728	0.946
NMU	0.701	1.000	1.000	1.000	1.000	0.940
NJ TECH	1.000	0.896	1.000	1.000	0.732	0.926
JSUT	1.000	1.000	0.568	1.000	1.000	0.914
NJIT	1.000	1.000	1.000	1.000	0.549	0.910
YZU	0.732	0.822	0.893	1.000	1.000	0.889
NJUPT	1.000	0.806	0.768	1.000	0.735	0.862
JUST	1.000	1.000	0.631	1.000	0.559	0.838
SOOCHOW	0.683	1.000	0.688	1.000	0.717	0.818
CZU	1.000	1.000	0.566	0.658	0.654	0.776
NUFE	1.000	1.000	1.000	0.415	0.397	0.762
CUMT	1.000	0.624	0.617	0.583	0.622	0.689
NJFU	0.630	0.721	0.606	0.732	0.625	0.663
NJUCM	0.745	0.586	0.581	0.681	0.551	0.629
JSNU	0.541	0.628	0.674	0.773	0.514	0.626
USTS	0.442	0.518	0.576	0.500	1.000	0.607
NTU	0.488	0.570	0.550	0.577	0.616	0.560
XZHMU	1.000	0.433	0.361	0.436	0.404	0.527
Effective Quantity (Ratio)	17 (0.654)	16 (0.615)	12 (0.462)	17 (0.654)	11 (0.423)	5 (0.192)

mine the amount of financial allocation of universities in the next five years according to the method of “basic allocation + performance allocation.”

In **Table 4**, the financial allocation of 26 universities in the next five years can be divided into two parts. The first part is the basic allocation. Considering the years a university education cost is relatively fixed, the amount of financial allocation from the government to universities should not be too volatile to affect running schools’ regular order. Therefore, the necessary allocation can continue to be calculated according to the original per student financial allocation model, i.e., the “funds allocated from public

**Table 4. Jiangsu Higher Education Performance Allocation.**

University	Funds Allocated from Public Finance Budgets for Education (10,000 CNY)						Next 5-yr Performance Grants (10,000 CNY/yr)
	2012	2013	2014	2015	2016	5-yr Average	
NJU	275,319	185,768	180,929	203,677	240,139	1.000	2,298
SEU	195,637	147,888	153,747	179,593	184,433	1.000	2,298
HHU	104,218	118,908	97,691	104,445	104,951	1.000	2,298
JU	99,796	103,594	109,543	87,778	96,320	1.000	2,298
NJNU	69,852	67,399	74,088	89,407	95,188	1.000	2,298
NUIST	34,112	35,528	38,400	45,299	48,521	0.969	2,227
NJAU	104,630	80,626	90,195	95,609	101,220	0.957	2,199
CPU	65,159	63,259	66,021	64,103	68,297	0.948	2,179
JSU	60,125	60,770	71,878	85,830	96,336	0.946	2,173
NMU	48,274	52,401	51,649	57,861	64,962	0.940	2,161
NJ TECH	53,887	63,345	67,949	76,033	84,595	0.926	2,128
JSUT	17,778	18,947	21,999	27,333	30,504	0.914	2,100
NJIT	29,823	28,615	31,846	39,344	44,355	0.910	2,091
YZU	73,563	71,205	75,267	92,704	100,005	0.889	2,044
NJUPT	35,378	57,617	48,422	56,283	64,615	0.862	1,981
JUST	31,764	32,135	35,977	43,412	46,886	0.838	1,926
SOOCHOW	117,323	110,408	122,910	143,076	146,781	0.818	1,879
CZU	22,822	24,864	29,681	37,151	38,582	0.776	1,783
NUFE	30,961	28,366	32,353	39,579	40,612	0.762	1,752
CUMT	96,108	88,547	96,813	101,329	107,894	0.689	1,584
NJFU	45,576	47,192	50,314	55,207	61,049	0.663	1,524
NJUCM	42,031	49,219	49,473	54,455	58,146	0.629	1,445
JSNU	35,958	37,911	41,549	50,180	54,166	0.626	1,439
USTS	29,354	27,370	32,137	37,686	41,491	0.607	1,396
NTU	52,671	49,828	52,179	62,332	68,054	0.560	1,288
XZHMU	30,463	33,784	33,369	37,908	45,227	0.527	1,211
Total	1,804,594	1,687,507	1,758,393	1,969,629	2,135,345	—	50,000

finance budgets for education educational” of each university in **Table 4** shall remain unchanged.

The second part is the performance allocation. The “incremental” method is adopted to keep the basic allocation unchanged, and the total fund allocation is determined by introducing the educational performance evaluation results.

Suppose the total annual incremental funds of 26 universities are calculated according to 500 million CNY. In that case, the average value and proportion of each university’s educational performance in five years can be used to calculate each universi-

ty's annual performance allocation amount in the next five years. The calculation formula is 500 million CNY  $\times$  (the five-year average performance of each college / the total five-year average performance of 26 universities). In this way, a university's educational performance will directly affect the number of performance grants it receives from the government over the next five years. If the government wants to increase incentives, it could increase the total amount of fiscal funds allocated to performance grants each year.

## **Conclusions**

The full implementation of budget performance management and the construction of a performance-oriented financial allocation model are China's fiscal input mechanism reform's current development trends. They are crucial measures to promote the modernization of the national governance system and capacity. Based on the actual situation and relevant data from 26 universities in Jiangsu Province, this paper constructed the "double dimensions" higher-education performance allocation index system and used the DEA model for empirical research. The following conclusions can be drawn.

First, the higher education performance distribution model can assess the development potential of universities. By constructing a "double-dimensions" performance distribution model, one can see different universities' development potential. Take appropriate incentive measures for universities with excellent development potential to motivate them to improve higher education performance further. On the other hand, it can be seen in which output factors each university has development potential. By setting scientific output performance indicators, colleges and universities will be guided to develop in a government-led direction and more high-quality talents suitable for economic and social development will be cultivated.

The second is that the higher education performance distribution model can evaluate the educational effectiveness of universities. This study found noticeable performance differences among the 26 sample universities, and this difference tends to increase to a certain extent. This phenomenon is not conducive to the improvement of the overall level of higher education in the region. Organizers of colleges and universities can scientifically evaluate each college's educational effectiveness in a certain period by setting up a "double-dimensions" performance distribution model to take targeted reward and punishment measures to encourage each college to improve its educational effectiveness actively.

Third, the higher education performance distribution model can evaluate the relationship between colleges' and universities' educational performance and capital investment. The funding method based on the performance distribution model will no longer be the original funding model based on the "number of students" but a comprehensive evaluation model based on "education performance." Under this model, universities' financial appropriations will be dynamic and change with education quality. Based on the college education performance evaluation results in the previous cycle, dynamically adjust the number of financial appropriations received by colleges and uni-

versities in the next cycle. This will bring external pressure to colleges and universities to continuously improve the quality of education.

## **Suggestion**

Based on the findings, the following suggestions are made to construct a new performance-oriented financial allocation system for higher education and optimize financial resource allocation, form a closed cycle of financial allocation “fund flow,” create clear policies and performance orientation, and guide universities toward continuous improvement of school operations and education quality.

The first is to strengthen the quality orientation and use funds to encourage universities to adjust their school-running behavior. In the context of public resource constraints and competition, through the implementation of performance appropriations, a certain amount of funds is associated with measurable indicators to guide colleges and universities to adjust or change school-running behaviors per government intentions to achieve the purpose of improving the quality of higher education teaching and research. The standard practices are (i) Increase the “process” and “output” indicators, such as the number of students studying in a year, the number of students taking the exam, the number of bachelor’s and master’s degrees and other learning completion indicators, the acquisition of international funds and external funds, research evaluation and other research quality indicators to enhance Relevance of funding to quality. (ii) Increase the performance share of public funding. China currently implements a higher education financial appropriation system of “per student expenditure + special subsidies.” The appropriation formula is mainly calculated based on the number of students enrolled, and the distribution of special subsidies mainly reflects performance. In the future, the reform of the higher education performance appropriation system proposes to increase the evaluation indicators of students’ study completion and academic achievement, increase the weight of financial incentives, and guide universities to shift from focusing on scientific research to equal emphasis on teaching and research.

The second is to set up an adjustment mechanism to promote the sustainable development of university finance. For a long time, there has been a low correlation between appropriation and performance in allocating fiscal funds in China. An essential feature of the budget management system’s ongoing reform is to improve the performance of fiscal expenditures, and it has proposed establishing a reform and performance-oriented per-student appropriation system. It is suggested that the new fiscal appropriation policy should set a period of adaptation and improvement to achieve a smooth transition and sustainable development of university finance.

The third is to pay attention to differentiated treatment and adapt to the actual needs of different objects. Performance appropriation generally does not only use a single model but mostly a combination of several models. How to further guide universities’ individualized development in reforming the current funding mechanism for colleges and universities in China should be fully considered in the top-level policy design.



The fourth is to insist on equal dialogue and improve the transparency of organization and implementation. The relationship between the government and the university is not a relationship between superiors and subordinates, but a relationship of equal consultation, encouragement and guidance, and partnership. In China, the government has long been the competent authority of higher education institutions, deciding on a university's principal allocation, faculty establishment, financial allocation, asset disposal, etc. The original intention of performance funding is to encourage colleges and universities to adjust and improve their school-running behavior and improve school-running quality and efficiency. Such an incentive should maximize the autonomy, enthusiasm, and creativity of colleges and universities. A platform for equal dialogue between the government and universities should be built to improve the transparency and participation of performance funding.

The fifth is to build a regulatory framework to form a synergy between internal and external forces to improve university performance. The cost structure occupies a large share of its financial expenditure, mainly the personnel cost, which is about two-thirds of the university's overall expenditure. This high proportion of fixed costs in overall expenditure limits the flexibility of university financial activities. Therefore, the actual attainment of performance funding is relatively limited in most schools. Performance appropriation is just a change in appropriation methods, and its ultimate purpose is to improve public funds' efficiency. It is difficult to achieve this goal by relying on a single financial means. A regulatory framework should be established to organically link financial incentives with other measures to truly achieve the higher education system's sustainable development and the high quality of education and research.

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