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Research Paper

Research on the Cultivation Efficiency of Graduates in China Business Schools Based on DEA Model

Pengbin Gao*, Qi Zhang, Yexin Liu
School of Economics and Management, Harbin Institute of Technology China
Corresponding Author: Pengbin Gao

ABSTRACT: *Based on the panel data of 23 business schools in China from 2018 to 2023, this study used the DEA and Malmquist index to evaluate the cultivation efficiency of graduates. The empirical results show that the overall cultivation efficiency of graduates is high but total factor productivity grows slowly. The results of ANOVA show that the location, type, and international certification of business schools have no significant effect on the efficiency. The results of the cross-analysis of technical efficiency and total factor productivity show that different business schools should design different development strategies.*
KEYWORDS: *Business School, Graduate Education, Cultivation Efficiency, Data Envelopment Analysis, Malmquist Index, ANOVA Analysis*

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I. INTRODUCTION

To adapt to the rapid economic growth, business education in China has gradually attracted widespread attention from the business community since the early 1990s. After more than 30 years of continuous exploration and improvement, business education has made significant progress in both scale and quality. The education model and internationalization level of business schools are gradually showing a diversified trend, and market competition is also exceptionally fierce. Business education has forged and delivered many management talents for the development of Chinese enterprises, playing a very important role in promoting rapid economic development. In the current rapidly developing economic environment, all organizations are facing resource shortages. Therefore, for business schools, once they are seen as production units, the effective utilization of resources will be a question worth exploring [1].

Previous studies have used various methods to evaluate the efficiency of business schools. According to online data from Bloomberg Businessweek, Palossay and Wood (2014) used the DEA method to calculate the relative efficiency of American business schools and conducted a comparative analysis of efficiency and rankings [2]. Recently, using the two-stage Bootstrap DEA approach, Rhaiem and Amara (2020) also analyzed the determinants of research efficiency in Canadian business schools [3]. In addition, many studies integrate multiple methods to evaluate the efficiency of business schools. Sreekumar and Mahapatra (2011) developed a comprehensive method combining data envelopment analysis and neural networks for evaluating and predicting the performance of Indian business schools [4]. Similarly, Pradhan (2016) also surveyed the ranking of business schools in India using a combination of data envelopment analysis and neural network modeling methods [5]. Kong and Fu (2012) also constructed a student-based performance evaluation model combining AHP and DEA for business schools in Taiwan to assess the impact of student's performance [6]. Moreover, many studies also focused on the efficiency of the MBA programs. Jaska and Swamy (2013) used DEA to examine the relative efficiency of the top 20 Indian public colleges that offer MBAs, which were chosen from a list provided by Careers 360, a magazine in India known for its university rankings [7]. Similarly, Fisher (2017) also used DEA to evaluate the value added to students by undergraduate business programs from a market as well as academic perspectives [8]. Recently, Ekiz and Tuncer (2020) employed a new DEA-based approach to evaluate 50 MBA programs and compared the results with those of other methods [9]. Furthermore, Amara et al (2020) evaluated the research efficiency of Canadian scholars in the management field through a combination of data envelopment analysis (DEA) and fuzzy set qualitative comparative analysis (fsQCA) [10]. Jamali (2023) also reviewed the determinants of research productivity and efficiency among the Arab world's accredited business schools [11].

In summary, although scholars have conducted extensive research on the research efficiency of business schools, there is still a lack of analysis for Chinese business schools, and research methods mostly use cross-sectional data for static analysis. Therefore, in response to the current lack of research, this study analyzes the efficiency of graduate education in Chinese business schools from both static and dynamic perspectives. The development of this study will not only help to understand the current situation of graduate education in Chinese business schools but also provide some reference for related research and decision-making.

The rest of this paper is arranged as follows. Section 2 is a research design, including data sources and the method model used in the research. Section 3 is the analysis results. Section 4 summarizes the research conclusions and suggestions.

II. RESEARCH DESIGN

2.1 Research Method

DEA is a multi-decision unit evaluation method developed based on "relative efficiency", which has the characteristics of no need to set production functions and weights and no need to normalize index units [12]. Given the advantages of DEA in evaluating the efficiency of multi-input and multi-output decision-making units, this method has been widely applied in multiple disciplinary fields. DEA usually provides three efficiency indicators, namely comprehensive efficiency (Crste), pure technical efficiency (Vrste), and scale efficiency (scale). Crste is the result of multiplying Vrste and Scale. In the model calculation results, if the value of Crste = 1, it means that the decision unit DEA is valid, and if the value of Crste < l, it means that the decision unit DEA is invalid.

Usually, the DEA-Malmquist index can be employed to analyze the changes in total factor productivity, which only considers radial adjustments and ignores nonradial relaxation. Therefore, this method cannot evaluate single-factor efficiency within a full-factor framework [13]. The productivity growth of a single unit in achieving its goals can be measured by the Malmquist index, which is the efficiency improvement relative to the benchmark frontier [14]. In the results of the Malmquist index, total factor productivity (Tfpch) can be decomposed into technological progress efficiency (Techch) and technical efficiency (Effch). In the calculation results, if the value of Tfpch > 1, it means that the total factor productivity change of the sample unit shows an upward trend; if the value of Tfpch < 1, it means that the change of total factor productivity of the sample unit shows a downward trend.

In this study, the input-oriented BCC model was used to measure the static cultivation efficiency of business schools by year, and the dynamic change of efficiency was analyzed by the Malmquist index. The analysis process was conducted by the STATA program. Moreover, variance analysis was used to analyze the difference in efficiency, and individual and group differences were displayed through graphics.

2.2 Data Source and Index Selection

In this study, China's Most Influential MBA Ranking, jointly compiled by the World Managers Group and World Entrepreneur Magazine, was selected as the data source. Since 2007, World Managers Magazine has selected the top 30 universities for comprehensive evaluations every year. World Manager Magazine adheres to the concept of marketing and customer first, focusing on the brand marketing concept of customer satisfaction with "products/businesses" as an important evaluation basis. It assesses multiple indicators such as college brand, social influence, faculty, student satisfaction, enterprise satisfaction, student quality, and teaching quality. The selection process mainly adopts various survey methods such as online questionnaires, newspaper questionnaires, and field investigations. Based on the survey and application results, experts are organized to conduct a comprehensive analysis and release the ranking results.

This study employed qualitative data: input indicators include school brand (I1) and faculty (I2); output indicators include student satisfaction (O1) and enterprise satisfaction (I2). Although the same evaluation criteria were used, the selected business schools vary each year. Considering that only 23 business schools have been consistently on the list from 2018 to 2023, they have been selected for analysis in this study. The business schools selected in this study are shown in Table 1. The geographical location, university type, international certification, and annual ranking of each business school are shown in Table 2. Descriptive statistics of each input-output indicator are shown in Table 3.

Table 1. Full names and abbreviations of the selected business schools

No.	Institution	Abbreviation
1	School of Management and Economics, Beijing Institute of Technology	BIT
2	School of Economics and Management, Beihang University	BUAA
3	China Europe International Business School	CEIBS
4	Glorious Sun School of Business and Management, DongHua University	DHU
5	School of Business, East China University of Science and Technology	ECUST
6	School of Management, Fudan University	FDU
7	School of Economics and Management, Harbin Institute of Technology	HIT
8	School of Management, Lanzhou University	LZU
9	School of Business, Nanjing University	NJU
10	Beijing International MBA at Peking University	NSD
11	Guanghua School of Management, Peking University	PKU
12	School of Business, Renmin University of China	RUC
13	School of Economics and Management, Southeast University	SEU
14	Antai College of Economics & Management, Shanghai Jiao Tong University	SJTU
15	College of Business, Shanghai University of Finance and Economics	SUFE
16	School of Economics and Management, Tsinghua University	THU
17	School of Economics & Management, Tongji University	TJU
18	School of Economics and Management, University of Chinese Academy of Sciences	UCAS
19	School of Business, University of International Business and Economics	UIBE
20	School of Economics & Management, Wuhan University	WHU
21	School of Management, Xi 'an Jiaotong University	XJTU
22	School of Management, Xiamen University	XMU
23	School of Management, Zhejiang University	ZJU

Table 2. Main characteristics of the selected business schools

No.	Institution	Region	Type	Accreditation	2018	2019	2020	2021	2022	2023
1	BIT	East	SE	AACSB/EQUIS/AMBA	20	22	24	27	27	27
2	BUAA	East	SE		24	23	22	25	23	20
3	CEIBS	East	FE	AACSB/EQUIS	4	4	3	4	2	3
4	DHU	East	C		11	11	11	11	11	11
5	ECUST	East	SE	AACSB/AMBA	21	21	25	23	20	21
6	FDU	East	C	AACSB/EQUIS	10	9	7	7	6	5
7	HIT	Northeast	SE	AACSB/AMBA	23	25	23	22	21	19
8	LZU	West	C	AMBA	8	8	8	8	8	8
9	NJU	East	C	AACSB	17	17	10	10	7	9
10	NSD	East	C	AACSB/EQUIS	7	7	6	15	14	10
11	PKU	East	C	AACSB/EQUIS	1	2	2	2	3	2
12	RUC	East	C	AACSB/EQUIS	9	10	9	9	9	7
13	SEU	East	C		29	30	29	30	28	29
14	SJTU	East	C	AACSB/EQUIS/AMBA	6	6	4	6	5	6
15	SUFE	East	FE	AACSB/EQUIS/AMBA	16	14	12	12	12	16
16	THU	East	C	AACSB/EQUIS	2	1	1	1	1	1
17	TJU	East	SE	AACSB/EQUIS/AMBA	15	15	17	18	15	15
18	UCAS	East	C	AACSB/AMBA	5	5	5	5	4	4
19	UIBE	East	FE	AACSB/EQUIS/AMBA	22	20	19	16	17	18
20	WHU	Central	C	EQUIS/AMBA	19	18	18	20	18	17
21	XJTU	West	C	AACSB	18	19	20	21	22	23
22	XMU	East	C	AACSB/EQUIS/AMBA	14	16	14	19	16	14
23	ZJU	East	C	AACSB/EQUIS/AMBA	12	12	13	13	10	12

Note: type (Science and Engineering =SE; Finance and Economics=FE; Comprehensive=C)

Table 3. Descriptive statistical analysis of evaluation indexes

	Indicators	Mean	S.D.	Min	Max
Input	Brand	17.0099	1.3078	13.32	19.02
	Faculty	21.6468	1.3674	18.49	25.72
Output	Student Satisfaction	17.2270	1.1436	14.01	19.26
	Enterprise Satisfaction	23.2523	3.7702	15.07	28.25

III. RESEARCH RESULTS

3.1 Static Efficiency Evaluation

The DEA model in STATA was used to calculate the static cultivation efficiency of business schools in 23 universities from 2018-2023, which are shown in Table 4 and Figure 1.

Table 4. Static efficiency score of the selected business schools

Institution	2018		2019		2020		2021		2022		2023	
	Crste	Vrste	Crste	Vrste	Crste	Vrste	Crste	Vrste	Crste	Vrste	Crste	Vrste
BIT	0.94	0.96	0.94	0.99	0.78	0.89	1.00	1.00	0.99	1.00	0.96	1.00
BUAA	0.83	0.98	0.84	0.98	0.92	0.95	1.00	1.00	0.94	0.96	0.97	0.99
CEIBS	0.98	1.00	0.98	1.00	0.93	0.94	0.96	0.96	0.97	1.00	0.94	0.94
DHU	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ECUST	0.89	0.97	0.90	0.99	0.97	0.98	0.95	0.95	0.95	0.95	0.96	1.00
FDU	0.95	0.97	0.93	0.98	0.98	0.99	1.00	1.00	0.97	0.99	1.00	1.00
HIT	0.83	0.95	0.88	0.97	0.85	0.90	0.98	1.00	0.96	0.96	0.94	0.99
LZU	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99
NJU	0.99	1.00	0.99	1.00	0.97	0.99	0.96	0.96	0.95	0.95	1.00	1.00
NSD	0.94	0.95	0.94	0.95	0.99	1.00	0.99	1.00	0.97	0.97	0.92	0.93
PKU	0.93	1.00	0.90	0.92	0.94	0.94	0.96	1.00	0.98	1.00	0.91	0.91
RUC	0.96	0.98	0.95	0.98	0.91	0.94	0.97	0.97	0.97	0.98	0.93	0.93
SEU	0.82	1.00	0.86	1.00	0.93	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SJTU	1.00	1.00	0.97	0.98	1.00	1.00	0.97	0.98	0.94	0.95	0.96	0.96
SUFE	0.85	0.95	0.85	0.96	0.90	0.96	1.00	1.00	0.98	0.98	0.93	0.97
THU	0.92	0.93	0.93	0.93	0.90	0.91	0.95	1.00	0.96	0.99	1.00	1.00
TJU	0.97	0.99	0.92	0.99	0.93	1.00	1.00	1.00	1.00	1.00	0.92	0.93
UCAS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.99	0.95	0.95
UIBE	0.94	0.99	0.95	1.00	0.87	0.91	1.00	1.00	0.99	1.00	0.96	0.98
WHU	0.93	0.94	0.94	0.97	0.91	0.93	0.95	0.98	0.94	0.96	0.99	1.00
XJTU	0.88	0.93	0.89	0.95	0.95	0.97	0.98	1.00	0.96	0.99	0.96	0.97
XMU	0.87	0.95	0.87	1.00	0.89	0.97	0.99	1.00	1.00	1.00	1.00	1.00
ZJU	0.91	0.96	0.88	0.96	0.86	0.94	1.00	1.00	0.94	0.94	0.99	0.99
Average	0.93	0.97	0.93	0.98	0.93	0.96	0.98	0.99	0.97	0.98	0.96	0.98

For the decision-making units, the overall static cultivation efficiency is high (score value > 0.93). The static cultivation efficiency of five business schools is below the average every year, including ECUST, HIT, SUFE, THU, and ZJU. In contrast, the cultivation efficiency of three business schools has an annual efficiency higher than the average, including DHU, FDU, and LZU. Moreover, according to the results of Table 4 and Figure 1, from the perspective of time, due to the fluctuation of pure technical efficiency and scale efficiency, the overall static cultivation efficiency of all business schools fluctuates.

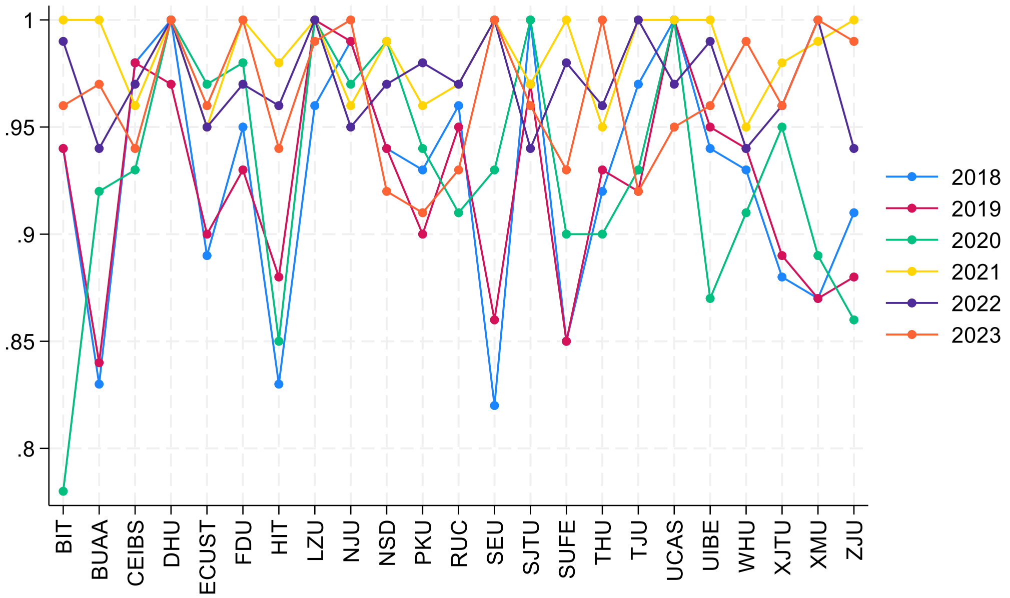

Figure 1: DEA efficiency of business schools

3.2 Dynamic Efficiency Evaluation

The Malmquist index in STATA was used to calculate the dynamic training efficiency in 23 universities from 2018-2023. The results are shown in Table 5 and Figure 2.

Table 5. Dynamic efficiency score of the selected business schools

Institution	2018~2019		2019~2020		2020~2021		2021~2022		2022~2023	
	Tfpch	Techch	Tfpch	Techch	Tfpch	Techch	Tfpch	Techch	Tfpch	Techch
BIT	1.00	1.01	0.84	0.82	1.32	1.29	0.98	0.99	1.01	0.97
BUAA	1.00	1.01	1.11	1.09	1.12	1.09	0.94	0.94	1.06	1.04
CEIBS	1.01	1.00	0.93	0.95	1.02	1.03	1.01	1.01	0.94	0.97
DHU	0.96	0.97	1.05	1.04	1.01	1.00	1.00	1.00	0.98	1.00
ECUST	1.00	1.01	0.98	0.97	1.15	1.11	0.97	0.98	1.02	1.02
FDU	1.00	0.98	1.02	1.06	0.98	1.01	0.97	0.97	1.01	1.03
HIT	1.05	1.05	0.98	0.96	1.17	1.16	0.98	0.98	0.99	0.98
LZU	1.01	1.00	1.03	1.05	1.00	1.00	1.00	1.00	0.96	0.99
NJU	1.00	1.00	0.96	0.98	0.96	0.98	0.99	0.99	1.04	1.05
NSD	1.00	1.00	1.03	1.06	1.00	1.00	0.96	0.97	0.95	0.95
PKU	0.99	0.97	1.04	1.04	1.01	1.02	1.01	1.01	0.90	0.93
RUC	1.00	1.00	0.92	0.96	1.05	1.07	1.00	0.99	0.93	0.96
SEU	1.05	1.05	1.09	1.08	1.10	1.07	1.00	1.00	1.04	1.00
SJTU	0.97	0.97	1.03	1.03	0.94	0.97	0.97	0.97	0.99	1.02
SUFE	1.00	1.00	1.01	1.06	1.10	1.11	0.97	0.98	0.95	0.94
THU	1.00	1.01	0.96	0.97	1.04	1.06	1.01	1.01	1.00	1.04
TJU	0.96	0.96	0.96	1.01	1.05	1.07	1.01	1.00	0.90	0.92
UCAS	1.01	1.00	0.97	1.00	0.99	1.00	0.97	0.97	0.94	0.97
UIBE	1.00	1.00	0.93	0.92	1.16	1.15	0.98	0.99	0.98	0.97
WHU	1.00	1.01	0.99	0.97	1.05	1.05	1.00	0.99	1.00	1.05
XJTU	1.00	1.00	1.08	1.07	1.04	1.03	0.98	0.98	1.02	1.00
XMU	1.01	1.00	0.98	1.03	1.08	1.11	1.01	1.01	1.00	1.00
ZJU	0.98	0.97	0.96	0.97	1.15	1.16	0.93	0.94	1.05	1.05
Average	1.00	1.00	0.99	1.00	1.06	1.07	0.98	0.99	0.99	0.99

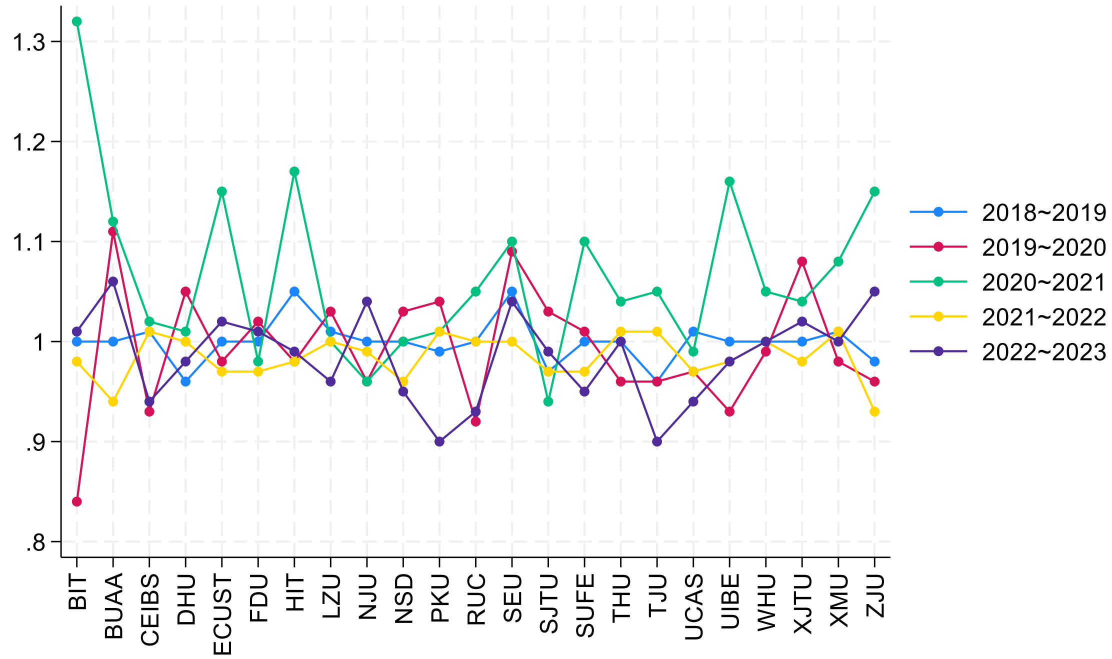

Figure 2: Malmquist productivity index of business schools

For the decision-making units, the cultivation efficiency of nine business schools is below the average every year, including CEIBS, DHU, NSD, PKU, RUC, SJTU, TJU, UCAS, and ZJU. In contrast, only one university's business school, namely SEU, has an annual efficiency higher than the average. Furthermore, according to the results of Table 5 and Figure 2, from the perspective of time, the overall dynamic cultivation efficiency of all business schools fluctuates. The main reason for the growth and decline is technological retrogression, with little impact on technological efficiency.

3.3 Individual Difference Analysis

Based on the results of the static and dynamic cultivation efficiency in 23 business schools from 2018 to 2023, the average values of two efficiencies were calculated, which are shown in Table 6.

Table 6. The average value of cultivation efficiency of the selected business schools from 2018 to 2023

Institution	BCC Model			Malmquist Index		
	Crste	Vrste	Scale	Tfpch	Techch	Effch
BIT	0.9337	0.9732	0.9579	1.0294	1.0164	1.0121
BUAA	0.9153	0.9777	0.9361	1.0459	1.0333	1.0116
CEIBS	0.9602	0.9749	0.9852	0.9790	0.9922	0.9865
DHU	0.9943	1.0000	0.9943	1.0007	1.0002	1.0003
ECUST	0.9252	0.9757	0.9484	1.0275	1.0171	1.0097
FDU	0.9721	0.9889	0.9829	0.9960	1.0108	0.9858
HIT	0.9062	0.9599	0.9436	1.0322	1.0277	1.0044
LZU	0.9835	0.9964	0.9871	0.9996	1.0076	0.9920
NJU	0.9772	0.9836	0.9936	0.9892	1.0021	0.9870
NSD	0.9597	0.9650	0.9945	0.9907	0.9960	0.9949
PKU	0.9366	0.9619	0.9744	0.9880	0.9965	0.9913
RUC	0.9485	0.9646	0.9834	0.9808	0.9950	0.9854
SEU	0.9354	1.0000	0.9354	1.0564	1.0409	1.0150
SJTU	0.9738	0.9783	0.9954	0.9822	0.9922	0.9900
SUFE	0.9193	0.9702	0.9470	1.0033	1.0186	0.9854
THU	0.9429	0.9589	0.9838	1.0029	1.0165	0.9869
TJU	0.9553	0.9851	0.9699	0.9772	0.9908	0.9865
UCAS	0.9869	0.9893	0.9976	0.9763	0.9894	0.9868
UIBE	0.9508	0.9782	0.9718	1.0085	1.0057	1.0028
WHU	0.9417	0.9615	0.9794	1.0062	1.0135	0.9933
XJTU	0.9369	0.9684	0.9671	1.0246	1.0180	1.0064
XMU	0.9374	0.9865	0.9498	1.0179	1.0290	0.9896
ZJU	0.9269	0.9666	0.9587	1.0142	1.0197	0.9947
Average	0.9487	0.9767	0.9712	1.0056	1.0100	0.9956

On the one hand, from the static perspective of cultivation efficiency, the average value of Crste, Vrste, and Scale in 23 business schools from 2018 to 2023 is 0.9487, 0.9767, and 0.9712, respectively. The static cultivation efficiency of thirteen business schools is below the average, including BIT, BUAA, ECUST, HIT, PKU, RUC, SEU, SUFE, THU, WHU, XJTU, XMU, and ZJU, and other business schools have higher than average static cultivation efficiency. On the other hand, from the dynamic perspective of cultivation efficiency, the average values of Tfpch, Techche, and Effch in 23 business schools from 2018 to 2023 are 1.0056, 1.01, and 0.9956, respectively. The dynamic cultivation efficiency of thirteen business schools is below the average, including CEIBS, DHU, FDU, LZU, NJU, NSD, PKU, RUC, SJTU, SUFE, THU, TJU and UCAS, and other business schools have higher than average static cultivation efficiency. Moreover, according to the results of Table 6, four business schools have lower static and dynamic cultivation efficiency simultaneously, and only one university's business school, namely UIBE, has higher static and dynamic cultivation efficiency simultaneously. Other business schools either have higher static cultivation efficiency and lower dynamic cultivation efficiency or have lower static cultivation efficiency and higher dynamic cultivation efficiency.

As shown in Figure 3, the average value of static and dynamic cultivation efficiency is distinguished by quadrifid graphs, in which the vertical coordinate represents the static cultivation efficiency and the horizontal coordinate represents the dynamic cultivation efficiency.

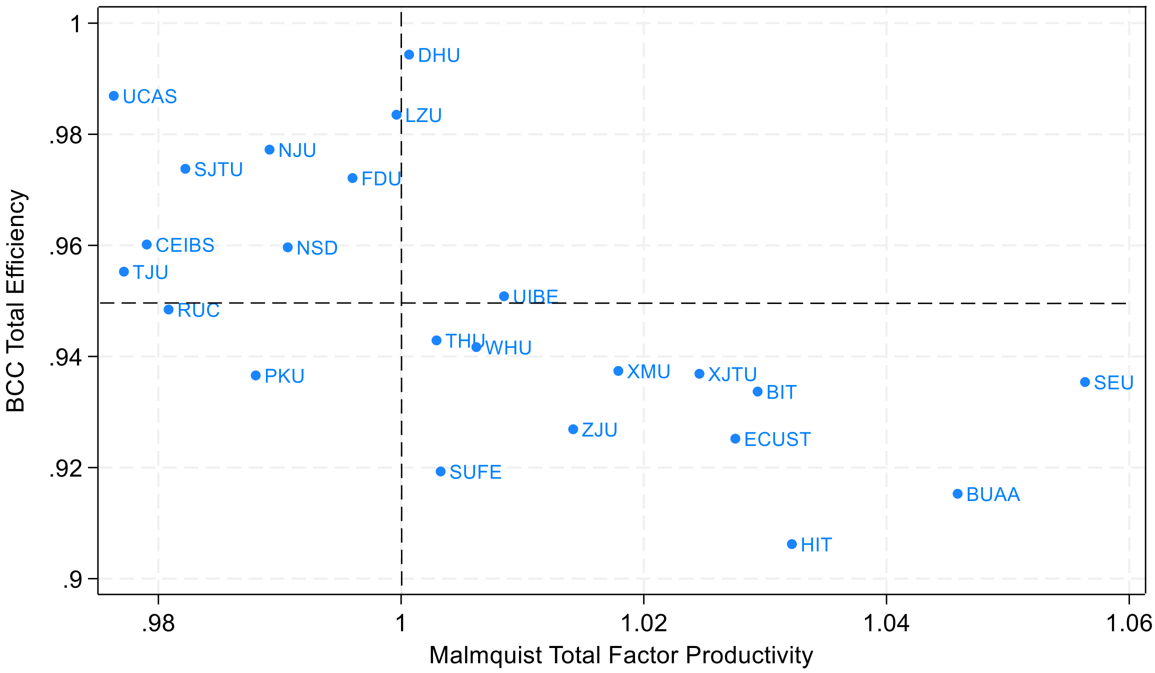

Figure 3: Quadrifid graphs of static and dynamic cultivation efficiency

According to the results of Figure 3, 23 business schools can be divided into four types. “High static and High dynamic” in Region 1 include two business schools, namely DHU and UIBE. In running activities of these business schools, the management is more scientific and reasonable, in terms of resource input can be effectively managed, and optimize the allocation, while ensuring a higher growth rate. “High static and Low dynamic” in Region 2 includes eight business schools, namely UCAS, SJTU, NJU, FDU, NSD, TJU, CEIBS, and LZU. Although the growth rate of these business schools is not high, they are still excellent in terms of resource allocation. “Low static and Low dynamic” in Region 3 includes two business schools, namely RUC and PKU. These two business schools can not only carry out effective resource management but also fail to achieve a higher growth rate. “Low static and High dynamic” in Region 4 include eleven business schools, namely THU, WHU, SUFE, ZJU, XMU, XJTU, BIT, ECUST, HIT, BUAA, and SEU. Although these business schools can also ensure a high growth rate, they are slightly worse in resource management.

3.4 Group Difference Analysis

To further analyze the static and dynamic cultivation efficiency, one-way ANOVA was employed to examine efficiency differences in several characteristics of business schools, and results are shown in Table 7, Figure 4, Figure 5, and Figure 6.

According to the results of Table 7, apart from the impact of the type of universities on overall efficiency, there is no significant effect of regional distribution, type of universities, and international certification on comprehensive technical efficiency and total factor productivity. Therefore, these characteristic variables do not play a decisive role in the change in efficiency.

According to the results of Figure 4, the static cultivation efficiency of business schools in comprehensive universities is high. Meanwhile, the total factor productivity in comprehensive universities also increases rapidly. Although the static cultivation efficiency of business schools in universities of science and engineering has the lowest value, their dynamic cultivation efficiency is the fastest. The static and dynamic cultivation efficiency of business schools in universities of finance and economics fall between the two mentioned above.

Table 7. Results of one-way ANOVA analysis

	BCC Model						Malmquist Index					
	Summary		Analysis of Variance				Summary		Analysis of Variance			
	Mean	S.D.	Source	SS	MS	F	Mean	S.D.	Source	SS	MS	F
Type												
C	0.957	0.022	Between	0.003	0.002		1.001	0.021	Between	0.002	0.001	
FE	0.943	0.021	Within	0.009	0.000	3.67*	0.997	0.016	Within	0.009	0.000	2.04
SE	0.927	0.018					1.022	0.026				
Accreditation												
0	0.948	0.041	Between	0.001	0.000		1.034	0.030	Between	0.003	0.001	
1	0.966	0.025	Within	0.012	0.001	0.64	1.004	0.018	Within	0.008	0.000	2.43
2	0.948	0.023					0.998	0.019				
3	0.942	0.019					1.004	0.019				
Region												
Central	0.942	0.000	Between	0.002	0.001		1.006	0.000	Between	0.001	0.000	
East	0.950	0.023	Within	0.011	0.001	1.29	1.003	0.023	Within	0.010	0.001	0.55
Northeast	0.906	0.000					1.032	0.000				
West	0.960	0.033					1.012	0.018				

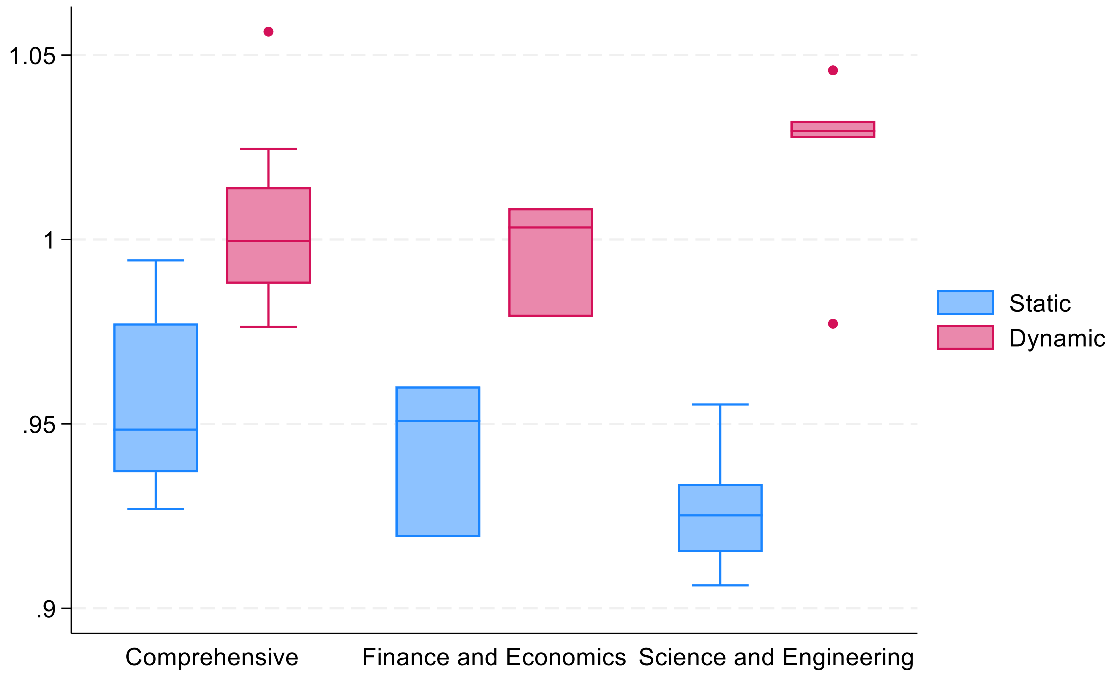

Figure 4: Bar chart of static and dynamic cultivation efficiency of business schools in different universities

According to the results of Figure 6, the static and dynamic cultivation efficiency of business schools that have not passed certification or have only passed one certification is good, while those that have passed two or three certifications perform poorly.

*Corresponding Author: Pengbin Gao

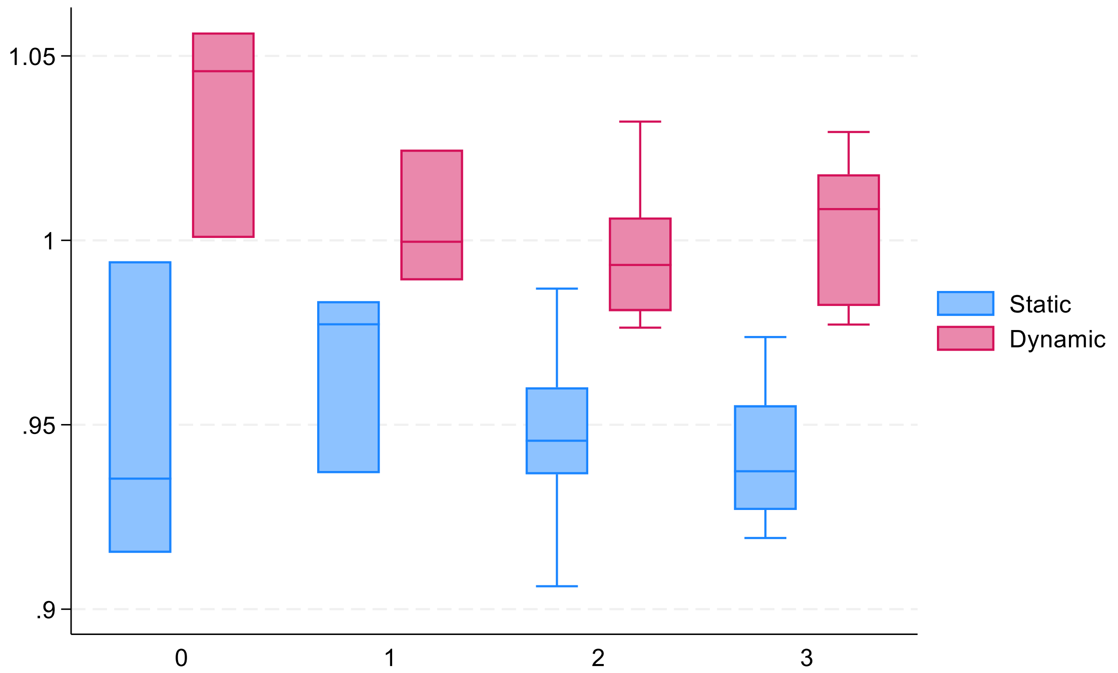

Figure 5: Bar chart of static and dynamic cultivation efficiency of business schools in different certifications

According to the results of Figure 6, the static and dynamic cultivation efficiency of business schools, from high to low, is west, east, and central. However, business schools in the northeast have the lowest static cultivation efficiency and the highest dynamic cultivation efficiency.

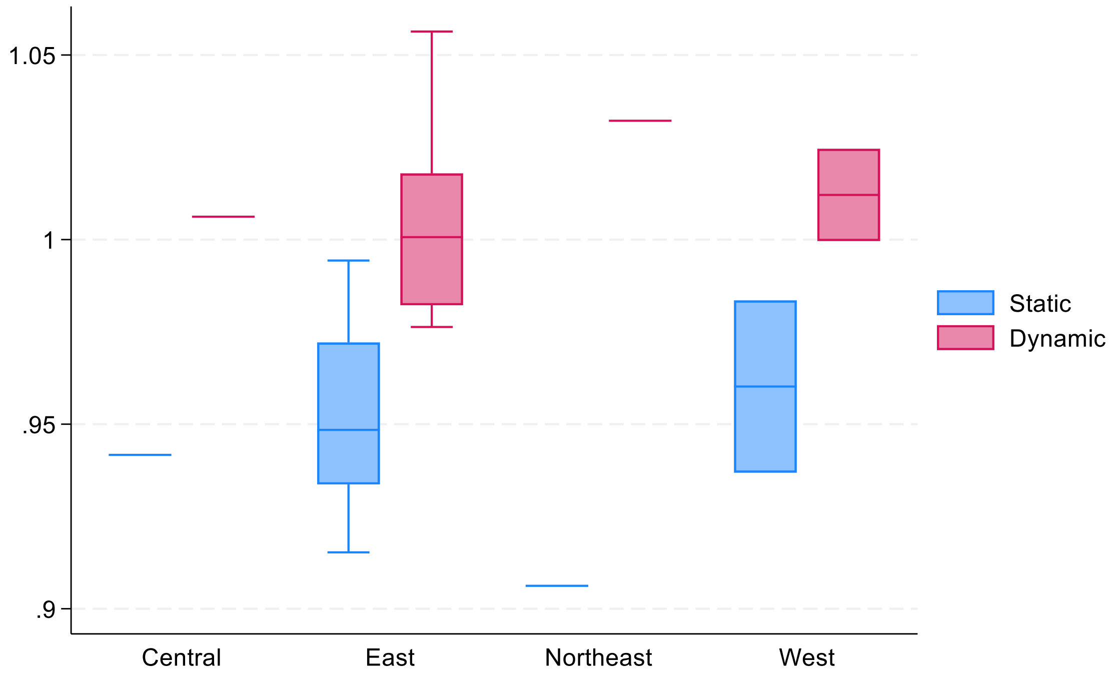

Figure 6: Bar chart of static and dynamic cultivation efficiency of business schools in different regions

IV. CONCLUSION

Based on the panel data of 23 business schools in China from 2018 to 2023, this study used the DEA and Malmquist index to evaluate the cultivation efficiency of graduates. The research conclusions are as follows. Firstly, the overall static cultivation efficiency of business schools is high, which shows that the selected business schools can optimize the allocation and management of organizational resources. From the perspective of time, due to the fluctuation of pure technical efficiency and scale efficiency, the overall static cultivation efficiency of all business schools fluctuates. Secondly, the total factor productivity of each business school is not high, which shows that the development speed of selected business schools is relatively slow. From the perspective of time, the overall dynamic cultivation efficiency of all business schools fluctuates. The main reason for the growth and decline is technological retrogression, with little impact on technological efficiency. Thirdly, based on the average value of technical efficiency and total factor productivity, 23 business schools can be divided into four types. The development situation of the double-high business schools is good and should be maintained. The other business schools should pay attention to the effective management and utilization of organizational resources. Lastly, the attributes of the business school to the university, the location of the business school, and the number of certified business schools have no significant impact on the change of technical efficiency and total factor productivity.

Although this study can provide some reference for related research, this study has some limitations that can be addressed by future studies. Firstly, due to limitations in conditions, it is not possible to systematically collect data on tuition fees, faculty, graduates' performance, and other objective indicators. Secondly, due to the limitations of rankings, it is not possible to include more business schools for analysis. Finally, other important factors that affect efficiency have not been fully discussed. It is expected to be perfected in subsequent research.

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*Corresponding Author: Pengbin Gao