COMPREHENSIVE ASSESSMENT OF THE LEVEL OF HIGHER EDUCATION DEVELOPMENT IN THE REGIONS OF CHINA

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This article calculates the higher education development level indicators of Beijing, Tianjin, Shanghai and Chongqing municipalities in China from 2013 to 2021, and provides the results of regression analysis of their relationship with regional GDP.

Keywords: higher education; regional GDP; complex indicator; sub-indicators; economic growth.

КОМПЛЕКСНАЯ ОЦЕНКА УРОВНЯ РАЗВИТИЯ ВЫСШЕГО ОБРАЗОВАНИЯ В РЕГИОНАХ КИТАЯ

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В статье рассчитаны показатели уровня развития высшего образования муниципалитетов Пекин, Тяньцзинь, Шанхай и Чунцин в Китае в период с 2013 по 2021 год, а также приведены результаты регрессионного анализа их связи с региональным ВВП.

Ключевые слова: высшее образование; региональный ВВП; комплексный показатель; субиндикаторы; экономический рост.

The first step is to build an evaluation system for higher education indicators in China's municipalities directly under the Central Government. Four municipalities directly under the Central Government in China are selected as the objects to be evaluated, and the time span is 2013–2021. There are 8 evaluation indicators that reflect the development level of higher education, namely: X1 – the number of general institutions of higher education in each province of China; X2 – the average number of students enrolled in institutions of higher education per 100,000 population in China; X3 – education expenditure in each province of China; X4 – education expenditure of local finances in China; X5 – the number of full-time teachers in general institutions of higher education in China; X6 – the total number of teaching staff in general institutions of higher education in China; X7 – the number of graduates of general institutions of higher education in China (in 10,000s of people); and X8 – the ratio of students to teachers in general institutions of higher education in China.

The second step is to standardize the indicators and use the extreme value method to standardize the statistical data. The calculation method is as formula (1)–(2).

$$\begin{cases} x_i = \dfrac{X_i - min}{max - min} & (1) \\ x_i = \dfrac{max - X_i}{max - min} & (2) \end{cases}$$

X1 to X7 are positive indicators, that is: the greater the indicator value, the greater the higher education comprehensive index;

X8 is a reverse indicator, that is, the smaller the value of this indicator, the greater the higher education comprehensive index.

Since all sub-indicators included in this system are positive, formula (1) is used. Entropy method proposed in [1, pp. 61–70] was used to determine the weights of sub-indicators.

The third step is to calculate the entropy value (information entropy) of each indicator, formula:

$$P_i = -\frac{1}{\ln k} \cdot \sum_1^m p_i \cdot \ln p_i.$$

Among them, P_i represents information entropy, p_i represents the probability (proportion) of each indicator appearing in the group; k represents the year, m represents the number of indicators.

If $p_{ij} = 0$, then $\lim p_i \ln p_i = 0$.

The fourth step is to calculate the weight, formula:

$$w_i = \frac{1 - P_i}{m - \sum P_i}.$$

The fifth step is to calculate the comprehensive index of higher education in China's municipalities (see table).

To study the relationship between higher education and economic growth in Chinese municipalities, a regression analysis was conducted on the higher education comprehensive index and GDP [2] and results are as follows (fig. 1).

Table

Comprehensive Index of Higher Education in Chinese Municipalities

Higher Education Comprehensive Index	Beijing	Tianjin	Shanghai	Chongqing
2013	0,160	0,144	0,269	0,032
2014	0,241	0,262	0,247	0,106
2015	0,400	0,225	0,218	0,234
2016	0,389	0,170	0,184	0,286
2017	0,588	0,419	0,341	0,400
2018	0,558	0,424	0,396	0,433
2019	0,668	0,507	0,512	0,623
2020	0,774	0,620	0,655	0,808
2021	0,826	0,750	0,819	0,971

By conducting a P test on the above regression equation, we found that $P < 0.01$, means 1-α is reliable with a 99 % confidence interval. It means the inspection passed.

1. The R2 of the 4 municipalities are all high, indicating the the regression equations fit well, and Chongqing > Tianjin > Beijing > Shanghai;

2. To observe the impact of higher education in municipalities on GDP, that is, to examine the changes in the coefficients (k values) of the regression equation : $k = \Delta y / \Delta x$.
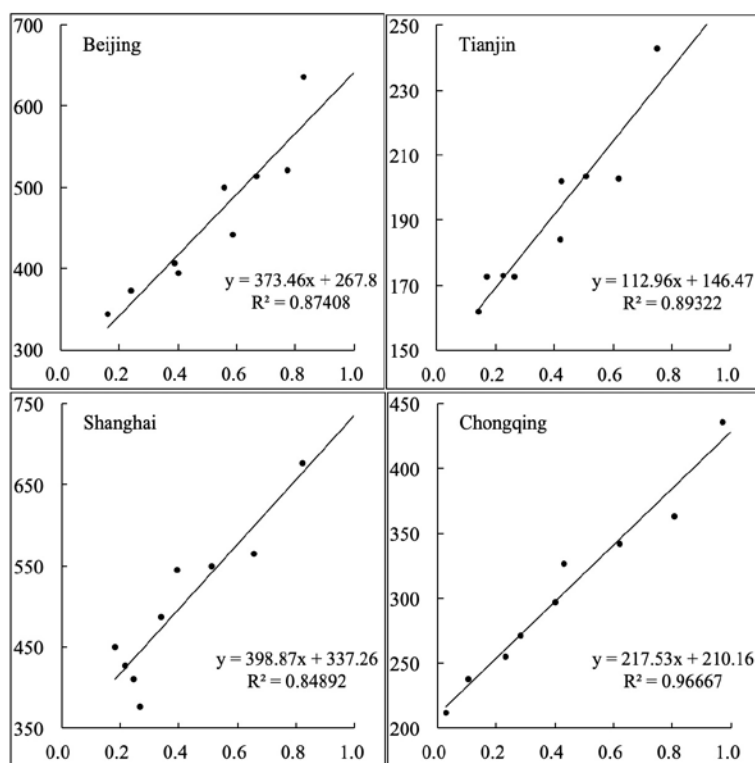
Results of regression analysis

It was found that the higher the coefficient of the regression equation, the greater the impact of municipal higher education on GDP.

Conclusion. Based on panel data for the period from 2013 to 2021, calculations were made of a comprehensive indicator of the level of development of higher education for four municipalities in China – Beijing, Tianjin, Shanghai and Chongqing. The calculation results show that the level of development of higher education among municipalities in China varies significantly.

As an example, a regression analysis of the relationship between the values of the complex indicator and the regional GDP of the municipalities of Beijing, Tianjin, Shanghai and Chongqing was performed. The regression equations for all four municipalities have a good degree of approximation, which indicates a significant impact of the level of higher education on regional GDP.

References

1. *Fang D., Ma W.* Study on the Measurement of China's Inter-Provincial High-Quality Development and Its Spatial-Temporal Characteristics // Regional Economic Review. 2019. P. 61–70.

2. China National Database. [Электронный ресурс]. URL: https://data.stats.gov.cn/english/ (дата обращения: 18.02.2024).