10.18686/rcha.v2i1.3511

Grey Correlation Analysis between Higher Vocational Education and Economic Development in Hubei Province

Zhexi Zhang

College of Law and Humanities and Social Sciences, Wuhan University of Technology, Wuhan 430000, China.

Abstract: The relationship between vocational education and coordinated economic development has always been an important topic in the academic circle. This paper analyzes the current situation of higher vocational education and industrial structure in Hubei Province, and uses the gray correlation method to empirically analyze the correlation between higher vocational education and regional economic development and industrial structure in Hubei Province based on the data of Hubei Province from 2018 to 2021. The results show that higher vocational education in Hubei Province has a strong correlation with economic development and is coordinated with industrial structure optimization.

Keywords: Higher vocational education; Economic development; Gray correlation degree; Coordinated development

1. Proposing the problem

Vocational education is an important part of modern education. The future ideals and aspirations of the educated are one of the goals of their vocational education activities. School education also incorporates this goal into one of its educational purposes. As the highest level stage of vocational education, higher vocational education is the best period for vocational education.

Many scholars have studied the relationship between education and macroeconomic growth. Construct a three-dimensional path for the joint development of vocational education and regional economy, and realize the mutual benefit and win-win situation and deep-level linkage development of the two[1]. The specialty setting of vocational colleges must adapt to regional economic development and social needs, and fit with the industrial structure, so as to promote vocational education to help regional economic development[2]. By selecting four countries as samples, this paper analyzes the relationship between the development of vocational education and the mode of economic operation, and concludes that high-level vocational education is an important factor in the economic development of countries with manufacturing as the main industrial form[4].

2. Construction of grey theory model of coordinated development of higher vocational education and economy in Hubei province

Grey correlation analysis is a method based on the sample sequence in the grey system, which describes the correlation of various factors in the system and discusses the main factors through analysis. This paper will construct the grey system of 18 development level indexes of economic development, industrial structure and higher vocational education in Hubei province. Based on the selection of indicators by previous literature scholars, the data of economic development evaluation indicators over the years are used as reference sequences. The data of 13 vocational education development evaluation indicators over the years are used as a comparative sequence to reflect the scale and quality of higher vocational education in Hubei Province.

Under the economic development evaluation index, it includes three secondary indicators, including: economic aggregate, including regional GDP (Y1), and fixed asset investment growth rate (Y2). The industrial structure includes the proportion of the primary industry (Y3), the proportion of the secondary industry (Y4), and the proportion of the tertiary industry (Y5). Under the evaluation index of higher vocational education development, it includes five secondary indicators, including : government level, including the average annual financial allocation level (X1), horizontal technical service to the amount (X2), and the number of authorized patents (X3) ; at the school level, it includes the area of teaching and auxiliary and administrative office space per student (X4), the value of teaching and scientific research equipment per student (X5), and the number of full-time students (X6) ; at the student level, including the end-of-year employment rate (X7), the average monthly salary of graduates (X8) ; at the teacher level, it includes the ratio of students to teachers (X9), the proportion of full-time teachers with double-quality teachers (X10), and the proportion of full-time teachers with master 's degree or above (X11); at the enterprise level, it includes the satisfaction of graduate enterprises with graduates (X12) and the total annual class hours of part-time teachers in enterprises (X13).

Table 1 Economic and social development indicators of Hubei Province from 2018 to 2021

	2018	2019	2020	2021
X1	13442.57	13773.9	12380.78	12025.72
X2	14897.96	26083.81	27829.24	24286.83
X3	1031	1154	1225	1433
X4	19.97	18.77	17.73	19.16
X5	9042.03	9809.45	9877.1	9596.41
X6	437890	460430	500190	560882
X7	94.93	94.8	86.49	91.16
X8	3755.06	3979.62	3800.17	3993.83
X9	15.32	15.3	15.85	16.3
X10	58.77	64.79	57.11	59.53
X11	43.86	46.35	49.14	51.86
X12	95.32	96.5	96.06	96.52
X13	1096050.31	1281980	1319047.62	1452630.01
Y1	39366.55	45828.31	43443.46	50012.94
Y2	11.0	10.6	-18.8	20.4
Y3	0.09	0.083	0.095	0.093
Y4	0.434	0.417	0.392	0.379
Y5	0.476	0.5	0.513	0.528

The steps of grey correlation degree are as follows:

Determine the comparison object and the reference sequence. Suppose there are m evaluation objects, n evaluation indexes, and the reference sequence is: $x_0 = \{x_0(k) | k = 1,2,\ldots n\}$, The comparison series is: $x_i = \{x_i(k) | k = 1,2,\ldots n, i = 1,2,\ldots m\}$.

1. Perform dimensionless processing, that is, mean processing.

$$x_i'(k) = \frac{x_i(k)}{\overline{x}_i}$$

Table 2 Dimensionless results (two decimal places)

2. Calculate the grey correlation coefficient:

$$\xi_i(k) = \frac{\min\limits_s \min\limits_t |x_0(t) - x_s(t)| + \rho \max\limits_s \max\limits_t |x_0(t) - x_s(t)|}{|x_0(t) - x_i(t)| + \rho \max\limits_s \max\limits_t |x_0(t) - x_s(t)|}$$

In order to compare the correlation coefficient of the sequence xi to the reference sequence x0 on the kth index, which is the resolution coefficient. The greater the resolution coefficient, the greater the resolution; the smaller the resolution coefficient, the smaller the resolution.

3. Calculate the grey correlation degree. The calculation formula of grey correlation degree is:

$$r_i = \sum_{k=1}^{n} \xi_i(k) / n$$

Table 2 Grey correlation degree

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13
Y1	0.81	0.46	0.71	0.62	0.71	0.76	0.67	0.77	0.66	0.65	0.73	0.67	0.75
Y2	0.57	0.55	0.56	0.57	0.56	0.56	0.57	0.56	0.56	0.57	0.56	0.56	0.56
Y3	0.66	0.57	0.69	0.75	0.79	0.75	0.72	0.80	0.86	0.72	0.78	0.82	0.69
Y4	0.92	0.55	0.63	0.85	0.79	0.64	0.88	0.83	0.75	0.81	0.68	0.81	0.67
Y5	0.64	0.58	0.73	0.76	0.88	0.77	0.71	0.84	0.91	0.72	0.87	0.84	0.80

3. Conclusions and recommendations

From the correlation degree of each variable, it can be seen that the annual average financial allocation level, the number of full-time students, the average monthly salary of graduates and the regional GDP have the highest correlation degree, and the evaluation index of higher vocational education development has no obvious correlation with the growth rate of fixed asset investment. The ratio of students to teachers, the average monthly salary of graduates, and the satisfaction of enterprises with graduates are highly correlated with the proportion of the primary industry. The average annual financial allocation level, the average teaching and auxiliary and administrative office space area, and the year-end employment rate are highly correlated with the proportion of the secondary industry. The value of teaching and research equipment

per student, the ratio of students to teachers, and the proportion of full-time teachers with master's degree or above are highly correlated with the proportion of the tertiary industry. This conclusion is basically consistent with the actual situation, indicating that in recent years, the provincial government has expanded the enrollment of higher vocational education and increased the investment in financial funds for vocational education, which is conducive to colleges and universities to actively carry out scientific research projects, purchase experimental training machinery and equipment, cultivate more high-skilled talents, and then play a certain role in regional economic development. Among the three major industries, the high correlation between the ratio of students to teachers, the quality of teachers, and the investment in teaching and research equipment reflects that it is more important to pay attention to improving the overall quality of teaching management than blindly expanding the number of students enrolled in vocational colleges.

3.1 Adhere to the government as a whole to speed up the development of vocational education

At present, the problems of unbalanced development of higher vocational education in the province, homogenization of professional settings, uneven quality of training, and low social recognition still exist, and the contradiction that does not match the requirements of economic and social development and industrial transformation and upgrading is still serious. Government departments at all levels should be in accordance with the regulations and policies, learn the connotation of the document, break through the problem of solving the problem of vocational education capital investment, treat vocational education, basic education and general higher education equally, establish and improve the investment mechanism of vocational education, do everything possible to increase the investment in vocational education, and continuously expand the scale of vocational education[5].

3.2 Collaborative Education

Further improve the school-running system of industry-education integration and innovate the school-enterprise cooperation mechanism. Promote higher vocational colleges to build practical training bases in enterprises, and enterprises to build training bases in higher vocational colleges. Guide higher vocational colleges and high-quality enterprises to carry out technical cooperation, build a technical skills innovation platform, and serve the technical upgrading and product development of small and medium-sized enterprises in the region[6]. Vigorously promote order training, explore modern apprenticeship, and promote school-enterprise dual-subject sports people.

3.3 Reinforcement type

Strengthen project design guidance, strengthen process supervision and management, pay attention to construction quality effectiveness, and promote high-quality development of higher vocational colleges in Hubei Province. Support the construction of national “double high plan” higher vocational colleges, implement the construction of provincial double high plan higher vocational colleges, and build a number of high-quality colleges and characteristic professional groups[2]. Strengthen the construction of double-qualified teachers and build a number of national and provincial vocational education teachers' teaching innovation teams. Strengthen the construction of vocational education textbooks, school-enterprise cooperation in the development and construction of a number of characteristic textbooks and school-based professional textbooks.

References

[1] Lu Shaohua. Internal logic and development requirements of higher vocational education in the new era-A review of “reform and development of higher vocational education” [J]. Science and technology management research, 2021, Vol.41 (23) : 250-251. Bowlby J. A Secure Base: Parent-child Attachment and Healthy Human Development[M]. London: Routledge, 1988.

[2] Zhu Dequan, Xu Xiaorong. The linkage logic and three-dimensional path of vocational education and regional economy [J]. Educational Research, 2014,35 (7) : 45-53,68.

[3] Zong Chengqian. Talking about the combination of professional setting of vocational education and regional economic development [J]. China Training, 2017,8: 376

[4] Xu Guoqing. The dual dilemma of China 's dual economic policy and the development of vocational education from the perspective of economic sociology [J]. Education research, 2019,40 (1) : 102-110

[5] Yu Xiaofen, Fu Dai. Summary of Multi-index Comprehensive Evaluation Methods [J]. Statistics and Decision Making, 2004,11: 119-121

[6] Chen Jiamei, Wang Bin, Hu Yiwen, etc. Empirical Research on the Coordinated Development of Vocational Education and Economy in Changzhou - Based on Grey Correlation Analysis [J]. Industry and Technology Forum, 2022, Volume 21 (5): 66-68.