

**Study on the Coordinated and Coupling Development of Shanxi Vocational Education and Local Industry**

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**Abstract**

Based on the current situation of higher vocational education in Shanxi province and the situation of its regional economic development in prefecture-level cities, through the method of qualitative analysis, this study explores the relevance and coupling of the development of the two parts, puts forward the development model of "building a three-dimensional regional vocational education group" to break through the resource barrier between the prefecture-level cities, to improve the utilization rate of educational resources and serve the local economy well. It also provides theoretical decision-making support for promoting all-round high-quality economic development and training highly skilled talents in the later stage of Shanxi province, and also provides a new practical and innovative attempt for Shanxi higher vocational education to explore the mixed development path of "multiple co-governance" and "intelligent cloud governance" in the future.

**Keywords:** Vocational Education, Local Economy, Coupling Development, Skilled Talents

Manufacturing industry, as the foundation of our country, the foundation of a strong country and the key to enriching the people, is the main body of the whole national economy. It reflects the development level of productive forces and is of great significance to sustained economic prosperity and social stability. For example, the Implementation Plan of National Vocational Education Reform clearly puts forward that vocational education should have a diversified school-running pattern, and strive to stimulate enterprises' participation and promote the responsibility of endogenous driving force of vocational education. The "Double High Plan" also clearly points out that vocational education should be established to provide talent bonus for local economic and social development and serve regional development. As the main media of contemporary "intelligent manufacturing" talent training, educational digital technology is an important bridge to accurately connect with the supply and demand of universities and enterprises, and also an important aspect to guide higher vocational colleges to accurately serve and train high-quality technical talents needed for regional development.

## **1. Research Background**

It has a total of 11 cities above the prefecture level including Taiyuan, Datong, Yangquan, Changzhi, Jincheng, Shuozhou, Jinzhong, Yuncheng, Xinzhou, Linfen, Luliang and so on in Shanxi Province. In recent years, with the continuous expansion of Shanxi vocational education scale, the human capital level and scientific research and innovation ability of Shanxi Province have been greatly improved, which has made great contributions to the economic and social development. According to the report of Taiyuan on August 26, 2021 by CnR.CN , by the end of the 13th Five-Year Plan, the total number of technical talents in Shanxi Province has reached 2.02 million, with the ratio of senior, middle and junior talents 9.5:39.9:50.6. The overall quality of professional and technical talents has been improving. In the critical period of the 14th five-year development, Shanxi Province has put forward the talent measures of attracting and cultivating talents and using and retaining talents. And it is planned that by 2025, the total number of professional and technical personnel in the province will reach about 2.3 million, and the proportion of senior, middle and primary professional and technical personnel will increase to 10:40:50. The number of professional and technical personnel in all kinds of enterprises and public institutions, especially private enterprises, increase significantly. In addition, it is to cultivate and introduce a large number of high-level professional and technical personnel who will lead and support the high-quality development of economy and society in Shanxi province.

In terms of economic development, the year of 2021 is an important opportunity period for Shanxi's regional economy to usher in great development and great reform. It was reported that in the first quarter of 2021, Shanxi's economy had a good overall momentum of development, with GDP growing by 17.3 percent year-on-year. The industrial structure has been steadily advancing with rapid development of emerging industries and significant growth of the "Six New" industries. In order to promote the local economy rapid development in all aspects, Shanxi Province issued the document "Shanxi Province 14th Five-year Plan for New Business" It is also proposed that by 2035, digital innovation in Shanxi will play a leading role in improving the quality and efficiency of the real economy, the optimization of the industrial structure of each city will be further upgraded, the regional economic development will be greater transformation, and it will be built into the leading digital economy development highland in China.

### *1.1 Theoretical Base*

As the role of vocational education in serving local economic development becomes more and more obvious, scholars pay more and more attention to the relationship between the scale of higher vocational education and local economic development, and have achieved a lot of research outputs. At present, scholars at home and abroad either focus on the impact of economic development on the scale of higher vocational education from the perspective of single causal relationship, or mainly explore the mechanism of the scale of higher education on economic development, but there are relatively few studies on the coupling coordination between the two. In the field of empirical research, most scholars analyze the relationship according to the dimension of time, but few can discuss the coupling development relationship between the two from the perspective of practice and space.

In this context, we must consider the following four questions: Is it necessary for shanxi higher vocational education to develop new markets and services so as to provide a beneficial practice for promoting the high-quality and innovative development of regional economy? Does the social and technological imagination of vocational education as a digital and data-intensive industry represent an urgent need to reshape its innovative development model? Since innovation has a certain mode and purpose, should higher vocational education at the middle and low end of the chain of scientific and technological innovation "empower autonomy" through educational information technology?

### *1.2 Status Analysis*

It is understood that there are still a few relevant vocational education groups in Shanxi, but these non-entity vocational education groups are either insufficient in number, or uneven in regional distribution, or not smooth in the specific operation of the main body of the connection. So they cannot independently assume corresponding responsibilities and obligations and mobilize the enthusiasm of the participants. For higher vocational colleges in shanxi, Implementing the innovative development goals of higher vocational colleges through value-added, It can not only support the development of regional pillar industry, make higher vocational education become the endogenous variable of Shanxi's economic activities, but also become the "brick and tile" and basic element of constructing industrial chain, product chain, supply chain, capital chain and information chain, in order to lead the high quality development of Shanxi vocational education in the future new era. Therefore, as the service of local economic development of Shanxi higher vocational colleges, how they firmly grasp the new trend and new requirements, constantly lead to create a new situation of high-quality vocational education development, better service to the local and economic, is one of the urgent dilemmas to be solved.

For the long-term development of prefecture-level cities, higher vocational education, as the main force to transport skilled talents for local areas, how to break through regional barriers and navigate a new path of innovative development through more modern and advanced means under the background of the development of the new economy is also development idea that needs to be clarified by local policy subjects.

Therefore, this study will focus on the scale of Shanxi higher vocational education and the actual regional economic development to explore the feasibility of establishing "Three-dimensional Regional Vocational Education Groups" in each prefecture-level city in line with local needs through "intelligent cloud governance" and "empowering autonomy". It will provide useful practical case reference for the innovation and development of future higher vocational education in Shanxi Province and the formation of a virtuous circle pattern of "multiple co-governance" between higher vocational education and local economy. And it also provide a more accurate development orientation for building a new shared economic service platform in Shanxi.

## 2. Research Design

Since the scale of higher vocational education and regional economic development are comprehensive concepts, this study combines the existing relevant research results and concrete reality. On the basis of clarifying the coupling relationship between the scale of higher vocational education and regional economic development from a multidimensional and multi-level perspective, Finally, based on the three dimensions of education demand, education investment and education environment, six indicators are selected to reflect the number of students in Shanxi vocational colleges, the number of graduates and the number of colleges. In terms of the development path of vocational education innovation, the number of scientific research institutions and the number of enterprises engaged in scientific research are selected. In terms of regional economic development, three levels and five indicators are selected to measure the total economic growth (total economic production growth index), economic structure (tertiary industry growth, GDP composition ratio) and economic benefits (GDP growth rate, fiscal revenue). In order to ensure the continuity and authority of the data, the data in this study are mainly from the statistics of the Ministry of Education in 2019 and 2020, the quality annual report of the High Vocational college Network and the statistics yearbook of Shanxi Province. In the specific statistical analysis, the official statistics of the Ministry of Education only divide higher education into undergraduate and junior college. Therefore, the college referred to in this study mainly refers to all types of higher vocational colleges except undergraduate.

## 3. Empirical Results and Correlation Analysis

### 3.1 Discuss from the perspective of time series

On the basis of clarifying relevant concepts, the growth rate of the number of college students, graduates and colleges in 2019 and 2020 is statistically analyzed (see Table 1).

Table 1: Growth rate of Higher education in Shanxi Province, 2019-2020

The growth rate of year	College student in school	University student in school	College student	University student	Vocational College	University
2019	108	102	91	103	98	100
2020	109	102	99	106	104	103

As can be seen from Table 1, the number of higher vocational colleges increased more than that of ordinary undergraduate colleges in the past three years, and the proportion of students in higher vocational colleges increased faster than that of undergraduate colleges. But in terms of the number of graduates, although vocational colleges increased by 8 percent year on year, it still fell far short of the number of undergraduates. This phenomenon is closely related to Shanxi's geographical distribution, policy orientation, ability level and ideology.

In order to explore how to train skilled talents more comprehensively and develop vocational education in the future, this study makes a brief comparison between the scientific research

activities of enterprises on the regulation and traditional scientific research institutions that are closely related to the development of higher vocational education (see Table 2).

Table 2: Research institutions in Shanxi in 2019-2020

Year	Number of enterprises engaged in scientific research institutions	Number of research institutions
2019	348	154
2020	468	175

As can be seen from Table 2, the number of scientific research activities of those enterprises closely related to technological innovation in higher vocational education shows a significant growth trend. By contrast, older institutions grew more slowly, with a gap of more than 20 percent. This shows that enterprises in Shanxi have a strong initiative to participate in vocational education research and innovation in the future, and there may be a great space for cooperation and development in the future. However, the development speed of single scientific research institutions has not been able to catch up with the actual needs of enterprise science and technology development.

### 3.2 From the perspective of space

Due to limitations and traditional ideas, local higher vocational colleges in Shanxi lack distinctive characteristics in innovation and development, and hard to find their own development path, and the state of slavish following is more obvious. In addition, in the relatively closed cultural atmosphere of Shanxi, the development idea formed over the years is to develop first and then improve, and go step by step. As a result, vocational colleges are not clear about the overall development idea and lack of long-term planning.

In order to more clearly understand Shanxi regional economic impact on higher vocational education, based on the distribution of higher vocational colleges in various cities in 2019-2020, a comparative statistical summary is made to explore the coupling degree of the two in this study. The specific situation is shown in Table 3, 4, 5, 6 and 7.

Table 3: Overall Distribution of Higher Vocational Colleges in Shanxi from 2019 to 2020

Year	Taiyuan	Datong	Yanqiu	Changzhi	Jincheng	Suozhou	Jinzhong	Yuncheng	Xinzhou	Linfen	Lvliang
2019	26	2	2	3	1	2	3	5	1	2	1
2020	27	2	2	3	1	3	3	5	1	2	1

From the overall distribution of higher vocational colleges in Shanxi, Taiyuan and Shuozhou have a large increase. There was no change in growth in other regions. It is not hard to imagine that Taiyuan, the capital city, as the center of economic and political development, is also the center of vocational education development. Shuozhou, as the only prefecture-level city that has added vocational colleges, can also see that relevant policies are planned to radiate to other prefecture-level cities.

Table 4: Percentage distribution of GDP growth in different cities of Shanxi in 2019-2020

Year	Taiyuan	Datong	Yanqiu	Changzhi	Jincheng	Suozhou	Jinzhong	Yuncheng	Xinzhou	Linfen	Lvliang
2019	106.6	106.7	105	106	106.5	106.5	106.3	106.4	105.4	106	105.7
2020	109.2	106.8	106.7	107.4	107.4	102.7	107.1	107	105	102.8	105.2

It can be seen from the data in Table 4 that the GDP of all cities in Shanxi has been on the rise in the past two years, and Taiyuan has the highest cumulative growth rate in the past two years, indicating that Taiyuan, as the leader and core of development, will still be the vane of Shanxi higher vocational education and regional economic development in the future. The city with the smallest increase for the second consecutive year is Shuozhou, In particular, the development of Shuozhou shows a trend of rapid first and slow then, indicating that even with preferential policy support and injection of vocational education, local economic development will be positively affected to a certain extent in the short term. However, from the perspective of long-term impact, it still needs policy guidance, ideology, economic development and other external forces to strengthen innovation, which further confirms that although the state strongly encourages closely coupling between schools and enterprises, it still needs to comply with the law of educational development.

In order to explore the coordination between the tertiary industry and shanxi's macro economy in a more specific way, this study further analyzes the growth rate of the tertiary industry in various cities, as shown in Table 5.

Table 5: Growth of tertiary Industry by region in 2019-2020 (billion RMB)

Year	Taiyuan	Datong	Yanqiu	Changzhi	Jincheng	Suozhou	Jinzhong	Yuncheng	Xinzhou	Linfen	Lvliang
2019	499	313	174	408	326	298	660	513	390	406	493
2020	534	335	186	442	345	304	713	550	420	437	525

In terms of the growth of the tertiary industry, the average growth rate of the 11 prefecture-level cities was 107%. The highest growth rate is both in Jinzhong and Yuncheng, and keeping the lowest growth rate in Shuozhou. As for the deep reasons for the fastest economic growth in

Jinzhong and Yuncheng, we speculate that there may be a positive correlation and coupling relationship with the impact of Taiyuan and Yuci in the same city circle and the COVID-19, but there is no authoritative conclusion, which is also the field that we hope to further explore in this topic. As shown in Table 4, The GDP growth rate of Shuozhou is also the lowest. It can be seen that although the government has actively taken measures to promote the development of economy and employment, however, due to time, history, ideas and other reasons, no obvious benefits have been brought about in terms of economy or education.

In view of the hypothesis that changes in economic structure may affect the coupling degree of vocational education, this study further explores the composition ratio of GDP in each region (see Table 6).

Table 6: Composition of GDP by region 2019-2020

Year	Gross regional product ratio	First industry proportion	secondary industry proportion	Third industry proportion
2019	100	4.6	44.3	51.1
2020	100	4.8	43.8	51.4

As can be seen from Table 6, the first output ratio increased by 2%, the second by 7%, and the third by 3%.

Combined with Table 5 and Table 6, it is not difficult to find that the overall economic development momentum of Shanxi in recent two years is good, and the GDP is on the rise. Especially in 2020, per capita GDP of Shanxi will reach 45,724 Yuan, with an average growth rate of 6.2%, but the growth rate of the secondary industry is 5.7%, and the growth rate of the tertiary industry is 7.0%. And in the whole social employees, the tertiary industry employees accounted for 44%. This shows that the employment situation of tertiary industry is positively coupled with economic development. In addition, the number of undergraduate graduates is far greater than that of junior college graduates in Table 1. It can be found that the main force of tertiary industry that drives regional economic development is still undergraduate graduates. In order to achieve the leapfrog development of Shanxi higher vocational education in the future, it is necessary to reverse the social prejudice that everyone competes for undergraduate education and vocational education is inferior. At the concrete implementation level, the investment in economy and facilities should be increased, so that skilled talents can truly serve the regional economy, and "double high" vocational colleges can truly play a leading role. Of course, special attention should be paid to the fact that education investment itself is a long-term process, and the relevant responsible subjects should not rush for success, but should run vocational education out of social responsibility, let alone cooperate for the sake of cooperation, resulting in strong coupling.

After understanding whether the growth of economic aggregate and economic structure will inevitably coupling higher vocational education, this study starts from the direction of economic benefits to explore whether there is an inevitable relationship between economic benefits and

higher vocational education. See Table 7 for the specific distribution of fiscal revenue in various cities.

Table 7: Overall Distribution of Municipal Fiscal Revenue by Region in 2019-2020 (100 million RMB)

Year	Taiyuan	Datong	Yangquan	Changzhi	Jincheng	Suozhou	Jinzhou	Yuncheng	Xinzhou	Linfen	Lvliang
2019	373	119	57	150	125	90	150	80	81	126	174
2020	386	130	57	161	138	92	163	86	90	138	192

As can be seen from Table 7, the fiscal revenue of various cities has been in a positive growth state for two consecutive years, among which Taiyuan has the highest income and it has the lowest income in Yangquan. From the growth range, it has the lowest growth rate in Yangquan, and has the highest growth rate in Xinzhou. It shows that there is little relation between economic benefit and coupling development of vocational education scale development.

Based on the above situation, it can be concluded that the scale of higher vocational education in prefecture-level cities has a good synchronization with the economic structure and economic aggregate in the system of regional economic development level, but there is almost no coupling relationship with economic benefits.

#### 4. Countermeasure and Suggestion

In order to better promote the development path and training model of vocational education and strengthen the coupling relationship between Shanxi vocational education and regional economic development, it is suggested to strengthen top-level design and policy guidance. Secondly, the development model of "three-dimensional regional vocational education group" should be constructed to enhance the execution and influence of resource integration. Thirdly, actively promoting the deep cooperation between vocational colleges and enterprises, and opening up a new way of technological innovation and development of "empowering autonomy". Finally, deepen the multi-dimensional cooperative school-running mode and form the development mode of "multi-governance". To be specific:

Firstly, to strengthen top-level design. At the important moment of Shanxi's economic transformation and upgrading, if Shanxi's higher vocational education wants to innovate and seek change, it must first strengthen the top-level design and actively promote local higher vocational education and regional economic cooperation in running schools. At the intermediate level, it is suggested that all responsible parties actively transform government functions, streamline administration and delegate power. At the micro level, with three-dimensional group construction as the main development mode, to encourage enterprises as the main body of schooling, in charge of specific skills training; Higher vocational colleges in various cities take the initiative to pair up with colleges of the same type in Taiyuan, jointly responsible for imparting basic theoretical knowledge and sharing resources.



Secondly, relying on the regional characteristics, to build a new three-dimensional regional vocational education group. In the face of the new trend of Shanxi's economic development, new forms of business, new models, new technologies and new posts, the demand for highly skilled applied talents, it is suggested that demand-oriented talents should be first adopted through "intelligent cloud governance". Through the mode of "Smart cloud governance", "1+10 vocational education group groups" ( 10 prefecture-level three-dimensional regional vocational education group groups under one large vocational education park) with Taiyuan as the core and radiating to other 10 prefecture-level cities are constructed to eliminate the problems of administrative division and independent governance. In addition, through signing agreements, pairing, carrying out teacher training, student visits and other forms, to form a new development model of entity vocational education group in order to improve the utilization rate of educational resources and strengthen the cooperation between higher vocational education and regional economic development.

Third, making full use of "wisdom cloud governance" to achieve "empowerment autonomy". Firstly, it is suggested to speed up the path and training mode of vocational education innovation and develop a new way for higher vocational colleges and scientific research institutions or enterprises to engage in scientific research "enabling autonomy". Secondly, establishing a big data platform coupling higher vocational colleges and local large, small and micro enterprises to give full play to the regional radiation driving role, and make the technical demand standard finally realize the effective docking with the talent training standard. Thirdly, through digital means to adjust and optimize the layout structure of vocational education development, so as to revitalize the overall higher vocational education resources in Shanxi.

Fourthly, through online and offline integration, to establish a new pattern of "pluralistic co-governance" in running schools. In the future, campus teaching and online teaching will be further integrated, In this case, AR, VR, MOOCS, AI and other advanced online technical education methods adopted by the digital cloud platform of "multi-governance" will make it possible for local vocational colleges in Shanxi to cooperate in running schools in different places in the future. In terms of teaching management, teachers provide timely and targeted remote docking and guidance to students studying in different places through the cloud, so as to easily realize the dream of cloud synchronization of teaching and management, and cloud synchronization of learning and work. This is also a practical proof that the closer the multiple coupling cooperation between vocational education and local enterprises is, the better.

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