

Research on the Correlation Relationship between Personnels from Vocational Education and Regional Industrial Economy

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Abstract:

Vocational education has the dual attributes of education and economy, which is inseparable from the transformation of economic structure and industrial adjustment and upgrading. However, the causal relationship, equilibrium relationship and variable coefficient between industrial economic development and different levels of vocational and technical education are not clear. To solve this problem, through Granger causality test and Johansen cointegration Test, this paper combs out the specific correlation between the education in higher vocational college, secondary vocational schools and technical schools and important industrial economies such as transportation, finance and real estate. It is found that the leveraging effect of vocational education on industrial economic development is significantly greater than that of industrial development on vocational education. This leveraging strength on industrial economic development is far more than the change of vocational education itself. At the same time, higher education personnels have more obvious support for knowledge intensive and technology intensive industries, while intermediate skilled personnels have stronger support for industries with large number of employees and rich levels of employment.

Keywords: Vocational education, Skilled personnels, Industrial economy, Correlation.

I. INTRODUCTION

With the deepening of reform and opening up and the continuous development of higher education and vocational education, rejuvenating the country through science and education has always been in an important position in China's development strategy. According to the International Dictionary of education, vocational education is a variety of activities carried out inside and outside the school to enhance the vocational proficiency of workers, including curriculum training, on-site practice, skill training, etc [1]. It can be seen that vocational education has both the educational nature of subject learning and the economic nature of technical education. Vocational education is inseparable from labor supply, economic structure transformation and industrial adjustment and upgrading, which is an important link in the chain of economic development.

Zhuhai is one of the earliest special economic zones in China. It ranks 47th in the national ranking of GDP in 2021 and was selected as the top 10 urban sustainable development in China in 2021 [2]. Zhuhai

ranked fifth in “The 18th Report on Chinese Urban Competitiveness”, published by the Chinese Academy of Social Sciences and the Economic Daily in 2020. In 2021, the total resident population of Zhuhai reached 2449567, with 11 ordinary colleges and universities, 1 adult college, 9 secondary vocational colleges and 5 technical schools in Zhuhai. The economic development, industrial structure, population and the proportion and distribution of educational resources in Zhuhai are representative and the feasibility of research, which can become a research sample of the relationship between industrial development and vocational education in economically more developed areas.

Most of the existing literatures focus on the innovation of skilled personnel training mode, reconstruction of supply, reform of system and mechanism, integration of industry and learning and so on. They also agree that the shortage of highly skilled personnels has become a restrictive factor hindering the healthy development of economy and upgrading of industrial structure. However, the research on the mechanism of vocational education and regional industrial development lacks quantitative analysis and model analysis. It also ignores the different roles of intermediate and senior skilled personnels, which does not distinguish the different driving points of different levels of Vocational Education in promoting the development of regional industrial economy.

Based on the principles of measurement statistical method and combined with the data and characteristics of special economic zones, this paper takes important national economic industries such as transportation, catering and accommodation, finance and real estate and skilled graduates at different levels as the research object. It combs the causal relationship, equilibrium relationship and variable coefficient between various industries and education in colleges and universities, secondary vocational schools and technical schools. Compared with the existing research, the marginal contribution of this paper is to analyze the influence mechanism between different levels of vocational education and regional industrial economy in combination with the industrial development of specific regions. This paper takes the conclusion of quantitative analysis as the basis for the decision-making of the coordinated development of vocational education and industry, and supplements the existing literature from a new perspective.

II. RESEARCH BACKGROUND AND RESEARCH HYPOTHESIS

In 1960, Theodore W. Schultz delivered a speech on “Investment in Human Capital”, which re-examined the economic problems from the perspective of going beyond the traditional economic theory. He put forward that human capital is the main reason for promoting the growth of national economy, and believed that the quality of population and knowledge investment determine the future prospects to a large extent. Human capital theory points out that the continuous accumulation of human capital is the driving force and source of social and economic development, and education promotes the social distribution equality of personal income. He believes that human capital is the sum of the various opportunity costs of producers on education, vocational training, etc. and the sum of the stock of production, labor, management skills and health quality possessed by workers. According to this theory, graduates trained by higher education and vocational education belong to skill human capital, which comes from the continuous investment of education in general labor force.

Since the mid-1980s, the new economic growth theory has introduced the element of "intellectual and professional human capital" into the growth model. This theory holds that the accumulation of intellectual and professional human capital can continuously accumulate the income and promote the accumulation of the income of other input factors. Paul Rowe, an American economist, believes that the key to economic growth is not the accumulation of capital, but knowledge accumulation, and technological progress plays a decisive role in economic growth. This theory has promoted the advent of the high-tech revolution and the era of knowledge economy. According to this theory, the technical and skilled personnels trained in higher education and vocational education play an important role in industrial transformation and upgrading. The model of German "dual system" in Vocational and technical education in terms of enterprise participation in schooling, improvement of individual labor technology and enhancement of international competitiveness confirms the important role of skilled personnels in industrial transformation and upgrading.

Domestic research has done a lot of research on the impact of higher education on labor productivity and income, the relationship between vocational education and industrial structure, and the relationship between supply and demand of skilled personnels. For example, Sun Shuming and others believe that there is a lack of innovative talents in the process of industrial optimization and upgrading, and enterprises lack the training mechanism of innovative talents [3]; In Hu Mengping and others' mind, in order to do a good job in the analysis of the demand for personnels in key industries for the transformation of old and new kinetic energy, first, we should know the background and characteristics of the current transformation of old and new kinetic energy, second, we should analyze the supply and demand of personnels in key industries and master the gap of core talents, third, we should master the national distribution of personnels in key industries, and fourth, we should conduct a comparative study on the demand catalogue of personnels in key industries nationwide [4]. Cheng Yu believes that we should adhere to government guidance and market operation, coordinate and co govern multiple subjects, strengthen the guidance of industry organizations, give full play to the role of enterprises, strengthen the executive power of schools, improve supporting guarantee, and establish a vocational education supply mode based on the personnel demand orientation of economic development and industrial transformation [5]. Therefore, this paper puts forward the following hypotheses:

Hypothesis 1: the scale of higher education in local region can promote the transformation and upgrading of local industrial structure.

Higher education provides the necessary labor force for regional economic growth and industrial development. At the same time, these labor forces are not ordinary labor forces, but skilled personnels with advanced knowledge and technology. Winters once pointed out that most of them will choose cities closer to home and with more intensive social networks when the labor force is in the place of education and work [6]. Yu Changlin and Meng Xiangxu believe that higher education not only affects the transformation and upgrading of urban industrial structure by improving the innovation ability of cities and the income level of labor force, but also has certain differences in different regions. This difference depends on the size of local cities and educational financial expenditure [7].

Hypothesis 2: the promotion of vocational and technical education can promote the transformation and upgrading of regional industrial structure.

With the emergence of new economic industries and the continuous optimization and adjustment of regional industrial structure, the relationship between vocational education and industrial economic structure is becoming closer and closer. They adjust, influence and support each other and develop together. After empirical research, Guo Shuwei believes that vocational education has a positive impact and promotion on the development of the secondary and tertiary industries, and the promotion impact on the secondary industry is greater than that on the tertiary industry. In the process of action, the promotion effect of higher vocational education is greater than that of secondary vocational education [8]. When combing the interaction mechanism between vocational education and industrial structure, Su Lifeng concluded that vocational education affects the adjustment of industrial structure by stabilizing employment, improving the quality of human capital and driving technological innovation, and drives economic transformation by improving labor productivity [9].

III. RESEARCH ON THE CORRELATION BETWEEN PERSONNEL TRAINING AND REGIONAL INDUSTRIAL ECONOMY

Taking Zhuhai as an example, the observation period from 2007 to 2020 is selected, and the data processing is carried out with the help of Eviews 7.2.

Because the statistics do not distinguish the number of graduates from undergraduate colleges and higher vocational colleges, this study uses the number of graduates from undergraduate and higher vocational college (CV1) to measure the number of higher-level personnels. The number of middle-level personnels is measured by the number of graduates from secondary vocational schools (CV2) and the number of graduates from technical schools (CV3). The economic development of important industries is measured by the industrial values of transportation, warehousing and postal industry (CAV1), accommodation and catering industry (CAV2), financial industry (CAV3) and real estate industry (cav4). Among them, the number of graduates from undergraduate colleges and universities does not include the number of postgraduates. In order to eliminate the possible Heteroscedasticity in time sequences CAV1, CAV 2, CAV3, CAV 4, CV1, CV2 and CV3, these time sequences are logarithmically transformed. The transformed sequences are LCAV1, LCAV2, LCAV3, LCAV4, LCV1, LCV2 and LCV3. The logarithmic transformation will not affect the cointegration relationship in the original sequence. Johansen cointegration test, EG two-step method and Granger causality test are used to sort out the relationship between the number of personnels at all levels and the development of various industries.

TABLE I. Numbers of each sequence from 2007 to 2020

YEAR	Transportation, warehousing and postal industry value (unit: ten thousand yuan)	Accommodation and catering industry value (unit: ten thousand yuan)	Financial industry value (unit: ten thousand yuan)	Real estate industry value (unit: ten thousand yuan)	Number of graduates from undergraduate and higher vocational college (unit: person)	Number of graduates from secondary vocational schools (unit: person)	Number of graduates from technical schools (unit: person)
2007	296183	252938	362548	557336	15807	3857	739
2008	261885	297882	476876	517810	15041	4394	1005
2009	243676	266658	487100	806909	18423	4619	828
2010	259986	297878	615003	823105	20723	5085	825
2011	273198	319308	810289	1048900	22218	5614	1460
2012	283515	354606	1000366	1260630	27278	6391	1581
2013	351018	337937	1285901	1514744	27999	6623	1660
2014	385932	428615	1506778	1756378	30073	6995	1774
2015	498824	443838	1965668	2073493	33000	7289	1659
2016	501530	506313	2328031	2604804	32813	6262	1720
2017	601361	597804	2792050	2897558	30797	6907	1961
2018	689373	650791	3187515	2376471	35166	6803	2272
2019	586014	499949	3420508	2501723	38049	7059	2077
2020	606259	405113	4026717	2655298	37540	5565	2147

Note: data source form Zhuhai statistical yearbook

3.1 Stabilization Test of the Variables

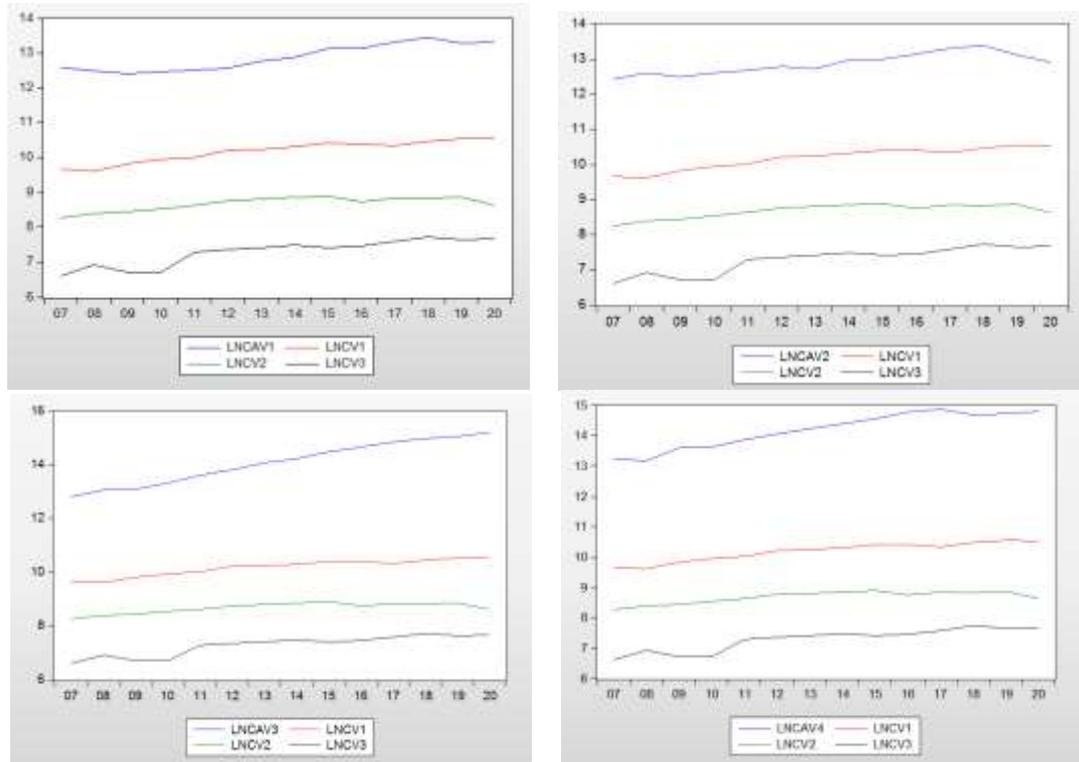


Fig 1: Trend diagram of each variable

The horizontal variable trend between the number of personnels at all levels and the development of various industries is shown in Figure 2. The change direction and trend of LCAV1, LCAV2, LCAV3, LCAV4 are generally consistent with those of LCV1, LCV2 and LCV3, which indicates that there may be a correlation between these sequences. Since the logarithmic sequences are non-stationary, Johansen cointegration analysis and Granger causality test are used to verify the long-term relationship between the sequences.

Since the premise of cointegration relationship is that the variables are non-stationary sequences, the unit root test should be carried out before cointegration analysis. ADF test is applied to time sequences LCV1, LCV2 LCV3, LCAV1, LCAV2, LCAV3, LCAV4, and their first-order difference sequences. After the stability test, the results are shown in Table II.

TABLE II. ADF test results

VARIABLE	ADF TEST STATISTIC	1% LEVEL	5% LEVEL	10% LEVEL	PROB.	RESULT
LCV1	-1.312603	-4.057910	-3.119910	-2.701103	0.5900	non-stationary
LCV2	-2.475717	-4.057910	-3.119910	-2.701103	0.1426	non-stationary

LCV3	-2.073090	-4.200056	-3.175352	-2.728985	0.2566	non-stationary
LCAV1	-0.183137	-4.057910	-3.119910	-2.701103	0.9189	non-stationary
LCAV1	-0.320374	-3.857386	-3.040391	-2.660551	0.9037	non-stationary
LCAV2	-1.527684	-4.057910	-3.119910	-2.701103	0.4887	non-stationary
LCAV3	-1.226745	-4.057910	-3.119910	-2.701103	0.6284	non-stationary
LCAV4	-1.382778	-4.057910	-3.119910	-2.701103	0.5575	non-stationary
DLCV1	-4.052273	-4.121990	-3.144920	-2.713751	0.0112	stationary
DLCV2	-2.901124	-4.420595	-3.259808	-2.771129	0.0130	stationary
DLCV3	-4.000746	-4.121990	-3.144920	-2.713751	0.0122	stationary
DLCAV1	-5.711778	-4.200056	-3.175352	-2.728985	0.0011	stationary
DLCAV2	-5.648490	-4.200056	-3.175352	-2.728985	0.0012	stationary
DLCAV3	-3.863269	-4.121990	-3.144920	-2.713751	0.0153	stationary
DLCAV4	-4.155995	-4.121900	-3.144920	-2.713751	0.0095	stationary

Note: DLCV1, DLCV2, DLCV3, DLCAV1, DLCAV2, DLCAV3, and DLCAV4 are the first-order differences of LCV1, LCV2, LCV3, LCAV1, LCAV2, LCAV3, and LCAV4 respectively.

The ADF test results of time sequences LCV1, LCV2 LCV3, LCAV1, LCAV2, LCAV3 and LCAV4 are greater than the significance level of 5%, which are a non-stationary sequences; The sequences DLCV1, DLCV2, DLCV3, DLCAV1, DLCAV2, DLCAV3, and DLCAV4 after the first-order difference are all less than the significance level of 5%, which are stationary sequences. It can be determined that LCV1, LCV2 LCV3, LCAV1, LCAV2, LCAV3 and LCAV4 are first-order single integer sequences, and it can be further tested that whether there is cointegration relationship or not between these time sequences.

3.2 Granger Causality Test

Granger test is used to check whether there is Granger causality relationship between sequences. It is determined that the optimal lag order is 1. The test results of Granger causality between LCV1, LCV 2, LCV 3, LCAV1, LCAV 2, LCAV 3 and LCAV 4 are shown in Table III.

TABLE III. Test results

NULL HYPOTHESIS	OBS	F-STATISTIC	PROB.	RESULT
LCAV1 does not Granger Cause LCV1	13	0.05129	0.8254	accept
LCV1 does not Granger Cause LCAV1	13	9.90661	0.0104	reject
LCAV1 does not Granger Cause LCV2	13	0.93451	0.1446	accept
LCV2 does not Granger Cause LCAV1	13	9.72368	0.0109	reject
LCAV1 does not Granger Cause LCV3	13	0.78197	0.3973	accept
LCV3 does not Granger Cause LCAV1	13	4.28653	0.0652	accept
LCAV2 does not Granger Cause LCV1	13	1.04471	0.3308	accept
LCV1 does not Granger Cause LCAV2	13	0.71947	0.4162	accept
LCAV2 does not Granger Cause LCV2	13	0.02444	0.8789	accept
LCV2 does not Granger Cause LCAV2	13	0.80818	0.3898	accept

LCAV2 does not Granger Cause LCV3	13	0.80908	0.3895	accept
LCV3 does not Granger Cause LCAV2	13	0.01513	0.9045	accept
LCAV3 does not Granger Cause LCV1	13	1.31101	0.2789	accept
LCV1 does not Granger Cause LCAV3	13	13.7877	0.0040	reject
LCAV3 does not Granger Cause LCV2	13	0.71369	0.4180	accept
LCV2 does not Granger Cause LCAV3	13	1.54662	0.2420	accept
LCAV3 does not Granger Cause LCV3	13	3.22737	0.1026	accept
LCV3 does not Granger Cause LCAV3	13	0.29843	0.5968	accept
LCAV4 does not Granger Cause LCV1	13	0.43364	0.5251	accept
LCV1 does not Granger Cause LCAV4	13	3.33696	0.0977	accept
LCAV4 does not Granger Cause LCV2	13	3.9E-05	0.9951	accept
LCV2 does not Granger Cause LCAV4	13	7.16022	0.0233	reject
LCAV4 does not Granger Cause LCV3	13	5.02235	0.0489	reject
LCV3 does not Granger Cause LCAV4	13	2.64240	0.1351	accept

Table III shows:

At the level of 5%, LCV1 could not cause LCAV1, which rejects the original hypothesis; LCV2 cannot cause LCAV1, which reject the original hypothesis. In other words, both LCV1 and LCV2 can cause the change of LCAV1. It can be seen that the development of transportation, storage and postal industry has not caused the change of the number of graduates from undergraduate and higher vocational colleges and secondary vocational schools, while the change of the number of graduates from undergraduate and higher vocational colleges and secondary vocational schools has played a role in the development of transportation, storage and postal industry.

At the level of 1%, the LCV1 could not cause LCAV3, rejecting the original hypothesis. In other words, LCV1 causes a change in LCAV3. It can be seen that the development of the financial industry has not caused the change of the number of graduates from undergraduate and higher vocational colleges, but the change of the number of graduates from undergraduate and higher vocational colleges has played a role in the development of the financial industry.

At the level of 5%, LCV2 could not cause LCAV4, rejecting the original hypothesis. In other words, LCV2 causes a change in the variable LCAV4. It can be seen that the development of the real estate industry has not caused the change in the number of graduates from secondary vocational school, but the change in the number of graduates from secondary vocational school has played a role in the real estate industry.

At the level of 5%, LCAV4 could not cause LCV3, rejecting the original hypothesis. In other words, LCAV4 causes the change of LCV3. It can be seen that the change in the number of graduates from technical school has not caused the change in the real estate industry, while the development of the real estate industry has caused the change in the number of graduates from technical school.

There was no Granger Causality relationship between the other sequences.

Therefore, it is only necessary to model estimate the five pairs of sequence groups: LCV1 and LCAV1, LCV2 and LCAV 1, LCV 1 and LCAV 3, LCV 2 and LCAV 4, and LCAV 4 and LCV 3.

3.3 Johansen Cointegration Test

Cointegration test means that although the two time sequences are unstable, their linear combination may show stationarity, and there is a long-term and stable equilibrium relationship between these non-stationary variables.

3.3.1. The correlation between the value of transportation, storage and postal industry and the number of graduates from undergraduate and higher vocational colleges

After Johansen cointegration test of LCAV1 and LCV1, it is found that there is only one cointegration equation between LCAV1 and LCV1 at the level of 1%, which is estimated as follows:

$$LCAV1 = 1.103067LCV1$$

It can be seen that there is a long-term changing trend between the value of transportation, warehousing and postal industry and the number of graduates from undergraduate and higher vocational colleges, and the latter plays a positive role in driving the development of the former. When the number of graduates from undergraduate and higher vocational colleges (LCV1) increases by 1%, the value of transportation, warehousing and postal industry (LCAV1) will increase by 1.103%.

3.3.2 The correlation between the value of transportation, storage and postal industry and the number of graduates from secondary vocational schools

After Johansen cointegration test of LCAV1 and LCV2, it is found that there are two cointegration relationships, because Johansen cointegration test believes that any linear combination of the two time sequences is stable. At this time, the EG two-step method is used for analysis. Through OLS regression model analysis, the residual sequence is obtained, and the Prob. of unit root test is 0.0253, indicating that the residual sequence is stable, and there is a cointegration relationship between LCV2 and LCAV1. The equation is:

$$LCAV1 = 2.185917 + 1.232090LCV2$$

It can be seen that when the number of graduates from secondary vocational school (LCV2) increases by 1%, the industrial value of transportation, warehousing and postal industry (LCAV1) will increase by 1.23%.

3.3.3 The correlation between the value of the financial industry and the number of graduates from undergraduate and higher vocational colleges

After Johansen cointegration test of LCAV3 and LCV1, it is found that there is only one cointegration equation between LCAV3 and LCV1 at the level of 5%:

$$LCAV3 = 2.271598LCV1$$

It can be seen that there is a long-term changing trend between the value of the financial industry and the number of graduates from undergraduate and higher vocational colleges. The number of graduates from undergraduate and higher vocational colleges plays a positive role in the development of the financial industry. When the number of graduates from undergraduate and higher vocational colleges (LCV1) increases by 1%, the value of the financial industry (LCAV3) will increase by 2.27%.

3.3.4 The correlation between the value of real estate industry and the number of graduates from secondary vocational schools

After Johansen cointegration test of LCAV4 and LCV2, it is found that there is only one cointegration equation between LCAV4 and LCV2 at the level of 1%, which is estimated as follows:

$$LCAV4 = 1.683877LCV2$$

It can be seen that there is a long-term change trend between the value of the real estate industry and the number of graduates from secondary vocational school. The number of graduates from secondary vocational school plays a positive role in the development of the real estate industry. When the number of graduates from secondary vocational school (LCV2) increases by 1%, the value of the real estate industry (LCAV4) will increase by 1.68%.

3.3.5 The correlation between the value of real estate industry and the number of graduates from technical schools

After Johansen cointegration test of LCAV4 and LCV3, it is found that there are two cointegration relationships, because Johansen cointegration test believes that any linear combination of the two time sequences is stable. At this time, the EG two-step method is used for analysis. Through OLS regression model analysis, the residual sequence is obtained, and the Prob. of unit root test is 0.0020, indicating that the residual sequence is stable, and there is a cointegration relationship between LCAV4 and LCV3. The equation is:

$$LCV3 = -0.972443 + 0.583364LCAV4$$

It can be seen that when the value of the real estate industry (LCAV4) increases by 1%, the number of graduates from technical school (LCV3) will increase by 0.58%.

3.4 Conclusion

3.4.1 The leveraging effect of vocational education on industrial development is significantly greater than the driving effect of industrial development on vocational education.

In terms of industrial development driving the development of vocational education, only the influence of real estate development on the education in technical school is found, and the influence coefficient is only 0.58. In terms of the development of vocational education driving industrial development, it is found that the education in undergraduate and higher vocational colleges plays a role in promoting the development of transportation industry and financial industry, and the education in secondary vocational schools plays a role in promoting the development of transportation industry and real estate industry. And the influence coefficients are 1.103, 2.27, 1.23 and 1.68 respectively, which is significantly bigger than the influence coefficient of industrial development on the education in technical school of 0.58.

3.4.2 The speed and strength of vocational education driving the industry forward far exceed its own changes

The influence coefficient of vocational education on finance, real estate, transportation, warehousing and postal industries is bigger than 1, which means that many industries affecting the national economy and the people's livelihood are developing at a rate of more than 1% when vocational education advances by 1%. In other words, the contribution rate of vocational education to industrial development and economic growth is greater than its own rate of change. It can be seen that a small step forward in vocational education can promote the economic output value of many important industries to take a big step forward.

3.4.3 Graduates from undergraduate and higher vocational colleges have more obvious support for knowledge intensive and technology intensive industries

To the same supporting impacts by senior skilled personnels, the influence coefficient of the number of graduates from undergraduate and higher vocational colleges on transportation, warehousing and postal industry is 1.103, while the influence coefficient on financial industry is 2.27. On the one hand, senior skilled personnels and higher education in undergraduate and higher vocational colleges play different roles in promoting and influencing industries with different requirements for informatization, technology, knowledge and innovation; On the other hand, the higher the level of knowledge and technology of the industry, the stronger the role and influence of senior skilled personnels and higher education, which coincides with the characteristics of the demand for knowledge-intensive talents in high-tech industries.

3.4.4 Intermediate skilled personnels are more helpful to industries with a large number of employees and rich levels of employment

To the same positive impacts on the development of transportation, storage and postal industry, the influence coefficient of the number of graduates from undergraduate and higher vocational colleges is

1.103, while the influence coefficient of the number of graduates from secondary vocational schools is 1.23. The main reason is that the transportation, storage and postal industry is typical representative of the tertiary industry, covering a wide range of fields, and the overall requirements for personnels are not high and diversified. This shows that intermediate skilled personnels can better promote the development of traditional and basic industries with a large number of employees and rich levels of employed people than senior skilled personnels.

IV. THE ENLIGHTENMENT OF DEVELOPMENT POLICY FOR VOCATIONAL EDUCATION

4.1 Attach Importance to the Development of Local Education and Give Full Play to the Scale Effect of Vocational Education

In the process of regional economic development, we should pay attention to the role of vocational education, expand the scale of vocational education, increase the number of audiences of vocational education, increase the investment in vocational education and the preferential strength of educational policies, improve the quality of vocational education, and exchange a small amount of human capital and educational investment for the substantial development of the industry.

4.2 Combine with the Regional Development Strategy and Focus on Developing Education at Different Levels

The same senior personnels and higher education play different roles in promoting and influencing industries with different requirements for informatization, technology, knowledge and innovation. Therefore, the train of thought and strategies of regional education development should be different with the different industrial layout and economic development strategy of each region. The adjustment, transformation and upgrading of knowledge intensive, technology intensive and creativity intensive industries such as high-tech industry, cultural and creative industry and financial industry need more senior talents. Regional governments should vigorously develop higher education in these areas; Undergraduate and higher vocational colleges, secondary vocational schools and technical schools should be key constructed in the regions where traditional industries account for a large proportion of the economy and that attach importance to the development of traditional industries to meet the needs of their rich personnel levels and large number of employees with more and more intermediate skilled personnels.

4.3 Change the Concept of Vocational Education and Objectively Evaluate Educational Background of Different Levels

Regardless of the layout of economic development strategy and industrial adjustment and upgrading, the basic industries and traditional industries in any region are essential in the development process. Moreover, compared with knowledge and technology intensive industries, the number and scale of basic and traditional industries are larger. Therefore, no matter how the regional economy is transformed, adjusted and upgraded, we should pay attention to the leveraging role of vocational education in supplementing labor force and enriching technical level in traditional industries and basic industries. We

could not blindly pursue higher education but recognize the necessity of vocational education and the importance of vocational and technical education background, and treat undergraduate education, higher vocational education and secondary vocational education equally.

V. CONCLUSION

The technical and skilled personnels trained in higher education and vocational education play an important role in industrial transformation and upgrading. Through cointegration analysis and in-depth testing of the statistical data of Zhuhai in recent 14 years, it is found that: first, The leveraging effect of vocational education on industrial development is significantly greater than the driving effect of industrial development on vocational education; Second, the speed and strength of vocational education driving the industry forward far exceed its own change; Third, personnels from higher education have more obvious support for knowledge intensive and technology intensive industries, while intermediate skilled personnels have stronger support for industries with large number of employees and rich levels of employment. Therefore, it is an effective way for developing regional industrial economy to objectively recognize vocational education, give full play to the scale effect of vocational education and focus on the development of vocational education at different levels.

PROJECTS WITH FUNDS

Zhuhai philosophy and social science planning project "Research on the Mechanism of Joint Training of Zhuhai Industrial Talents by Vocational Schools and Applied Universities" (No. 2021yba034) Project Leader: Tan Fei

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